THE

HICKOK

ELECTRICAL
INSTRUMENT
COMPANY

HICKOK

CARDMATIC

Dynamic Mutual Conductance
Tube Tester

MODEL 121

CHOICE OF THE EXPERTS
FOR SPEED, ACCURACY
and DEPENDABILITY...

CABLE: HICKOK-CLEVELAND
TWX NO: CV-662
WESTERN UNION: KJ
TELEPHONE: LIBERTY 1-8060

The HICKOK Electrical Instrument Company

Manufacturers of a complete line of

ELECTRICAL INDICATING INSTRUMENTS
ELECTRONIC TEST EQUIPMENT

10514 DUPONT AVENUE CLEVELAND 8, OHIO

Gentlemen:

To assure you of receiving the latest information available for the Model 121 Cardmatic Tube Tester, we are inaugurating a monthly mailing of data. The first mailing will consist of a complete index of available cards, Guide Sheet No. 101, and hand-punch instructions.

All future mailings will consist of a guide sheet of new tube information to be used with the hand-punch card set and other information which will be valuable in the operation of this tester. This hand-punch accessory kit consists of a steel hand-punch, fifty (50) printed blank cards, Engineering tube data request cards, and an index of test cards available with hand-punch information on each.

Our Engineering Department is constantly compiling data for test cards used with the Model 121. Since we are striving to meet the public demand, the tube information most frequently requested will be released first for production. Hand-punch information is available on special tube types at $.15 per card upon request. Test cards may be purchased either as a group, or as individual cards. When ordering individual cards, we suggest you send a remittance of $.15 per card.

When ordering parts or accessories for this model tester, please indicate model number and serial number so that no delay will be encountered in filling your order. Also, if special information is desired on this instrument, please feel free to contact us at any time.

We sincerely hope that the forth-coming monthly mailings will be of service in keeping you informed on all information pertaining the Model 121 Cardmatic Tube Tester.

Very truly yours,

Carl E. Lenke

C. E. Lenke, Manager
Parts and Service Department

CEL/cem

The Electrical Instrument Company

OPERATING INSTRUCTIONS

MODEL 121

CARDMATIC TUBE TESTER

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THE HICKOK ELECTRICAL INSTRUMENT COMPANY
10514 Dupont Avenue Cleveland 8, Ohio

STANDARD RETMA GUARANTEE

The Hickok Electrical Instrument Company warrants instruments manufactured by it to be free from defective material or factory workmanship and agrees to repair such instruments which under normal use and service, discloses the defect to be the fault of our manufacturing. Our obligation under this warranty is limited to repairing any instrument or test equipment which proves to be defective, when returned to us, transportation prepaid, within ninety (90) days from the date of original purchase and provided the serial number has been made known to us promptly for our records.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons or service stations in any way so as, in our judgement to injure their stability or reliability or which have been subject to misuse, negligence, or accident or which have had the serial number altered, effaced, or removed. Neither does this warranty apply to any of our products which have been connected, installed, or adjusted otherwise than in accordance with the instructions furnished by us. Accessories including all vacuum tubes not of our manufacture used with this product are not covered by this warranty.

This warranty is in lieu of all other warranties expressed or implied and no representatives or person is authorized to assume for us any other liability in connection with the sale of our products.

Parts will be made available for a minimum period of five (5) years after the manufacture of this equipment has been discontinued. Parts include all materials, charts, instructions, diagrams, accessories, etc., which have been furnished in the standard model.

RETURNING EQUIPMENT FOR REPAIR

Before returning any equipment for service, under warranty or otherwise, the factory must first be contacted giving the nature of the trouble. Instructions will then be given for either correcting the trouble or returning the equipment. Upon authorization, this equipment should be forwarded directly to THE HICKOK factory located at 10636 Leuer Avenue, Cleveland 8, Ohio, or to a designated service station in your locality. All correspondence pertaining to repairs should be directed to HICKOK Electrical Instrument Company, 10514 Dupont Avenue, Cleveland 8, Ohio, or to the authorized service station designated.

REGISTRATION CARD

The above guarantee is contingent upon the attached registration card being returned to the factory immediately upon receipt of the equipment.

DESCRIPTION

The Hickok Model 121 "Cardmatic" is a high quality, compact, portable tube tester especially designed for the technician and electronic serviceman.

The Model 121 combines flexibility and accuracy with the advantages of a high speed test. The outstanding features of this tester are found in the quality and completeness of the circuitry permitting Typical Operation checks as listed in the Tube Handbook.

The Hickok "wiping contact" card switch automatically sets up the exact test conditions for each tube.

The new, file-type card tray is conveniently located in the front half of the case. Cards can be quickly found, since they are held captively in numerical and alphabetical order. The cards are readily usable while still being physically attached to the instrument are practically automatically returned to their proper location after use.

The unit provides the variety of Basic Quality and Fringe tests necessary to determine the condition of a tube and its ability to perform properly in various electronic circuits.

Basic Quality tests include:

1. Mutual conductance - important in voltage amplifier triode and pentode types.

2. Rated Load Current tests - necessary to evaluate rectifier and diode types.

3. Peak current Knee tests - one of the most important evaluations for horizontal amplifier types.

4. Zero Bias and Cutoff, Current tests - new considerations in the practical testing of multivibrator and control tubes.

5. Handbook condition; controlled emission tests - for high power receiving and low power transmitting types.

Fringe Tests include:

1. High sensitivity "Shorts" and "Interelement Leakage" - automatically indicated on five neon lamps.

2. Heater to Cathode Leakage - Read directly on the "Leakage" meter scale.

3. Gas test indicated qualitatively on the red-green "Gas" scale, and quantitatively in microamps on the 0-10 linear scale.

4. Grid Emission - shown on Short lamps after tube has been allowed to come to operating temperature.

A special switch (the red #4 push button) provides for testing both sections of twin type tubes. The first section is checked for Shorts, Quality and Gas with the #4 button in its normal up position. The test conditions are transferred to the second section by depressing the #4 button and repeating the tests. Thus each section is checked quickly and independently.

The flexible circuitry of the Model 121 makes possible "Tailored Tests" in which the tube can be checked under special conditions, according to the application. For example, the 6SN7 is used as a Class A amplifier in the popular Williamson circuits. It is also widely used as a multivibrator in television and computer circuits. Meaningful tests for these two applications are quite different. Three 6SN7 cards are furnished. The first card and the #4 push button form a complete test for a 6SN7 used as an amplifier. Card 2 and Card 3 are "Tailored Tests" which test the tube for zero bias plate current and cut-off bias plate current respectively. These are the important conditions for a multivibrator. Thus the tube may be tested with card 1 only, or cards 2 and 3 only, or all three cards, as desired. The three cards provide a total of six (6) "Basic Quality" tests for the 6SN7. "Tailored Tests" are also applied to similar types such as the 12SN7 and 12AU7.

Another example of "Tailored Tests" is the 6BQ6 horizontal amplifier tube. Two cards are furnished. Card 1 is the amplifier test. Card 2 is a "Tailored Test". It is a special case of zero bias plate current known as the "Knee Test". It checks the ability to deliver the high peak currents encountered in horizontal amplifier applications. This "Tailored Test" is furnished for all horizontal amplifiers such as the 6DQ6, 6CD6, 6BG6, etc.

The metering circuit used in the Model 121 is a bridge type vacuum tube voltmeter. This circuit gives greater sensitivity and readability to the test results.

The reject point, between the red and green portions of the "LEAKAGE" scale, can be independently varied from 5 to 150 uamps depending upon the tube type being tested.

The reject point on the quality scale has over 4000 controlled values ranging from 100 microamps to over 400 milliamperes and from 85 micromhos to over 200,000 micromhos.

Gas current reject value is located at approximately 4 microamperes. However, the value may be read directly on the bottom, 0-10 scale. In many circuits even 1 microampere of gas current would be excessive; therefore this test should be interpreted according to the application of the tube.

OPERATION

Preliminary

1. Connect the line cord of the Model 121 to 115 volt 60 cycle AC source. This instrument is equipped with a three prong "Underwriters Type" plug. THE THIRD CONTACT OF THE SOCKET OR SOCKET ADAPTOR USED WITH THIS EQUIPMENT SHOULD BE ELECTRICALLY GROUNDED.

2. Turn tester "ON" by rotating the "LINE ADJUST" knob from the "OFF" position to one of the line voltage points. The 115 volt point is generally a good place to start since it represents the nominal expected line voltage.

3. Allow 20 to 30 seconds warm-up time for the internal vacuum tube voltmeter to stabilize. The meter needle will generally move up or down scale during this warm-up period. This action is normal and will cease when the tube reaches proper operating temperature.

4. Set "VTVM ZERO ADJUST" knob for a zero reading on the meter.

TUBE TESTING

1. Select the card, with number corresponding to tube type to be tested, from the card tray.

2. Insert tube into proper socket.

3. Insert card into slot of card switch - push card until switch engages, as indicated by the reject knob coming up.

4. Allow "warm-up" period for tube under test.

5. Push button "1". Set LINE ADJUST SWITCH so that meter needle indicates at the "LINE TEST" point on the dial.

6. Release button "1". Check for shorts and leakage on neon "SHORT" lamps.

7. Check for heater-cathode leakage as indicated on meter "LEAKAGE" scale.

8. Push button "2". Check condition of tube as indicated on meter "Quality" scale.

9. Push button "3". Check gas content as indicated on meter "Gas" scale.

10. If neon lamp beside button "4" is glowing--hold down button "4" and repeat tests "2" and "3". (Steps 8 and 9 above).

    This procedure checks the second section of twin-type tubes, such as a 12AX7. Holding down button "4" transfers the test conditions, established by the card, from the first section to the second section.

USE OF THE CARD TRAY

1. Locate the desired test card(s) in the tray.

2. Pull the card from the tray on its captive cord. "Ratchet" sounds will be heard as this is done. By stopping halfway through one of these sounds, the cord will catch for easy insertion of the card into the card switch. The card must be inserted with the printing up for proper operation.

   NOTE: The operation of the cord reel is similar to that of a window shade roller.

3. After the test is completed, push the release knob until it catches, and remove the card from the switch. To release the ratchet, pull the cord out slightly, then return card to its proper location in the card tray.

   CAUTION! Be certain the cord is not twisted when returning the card to the tray.

MAINTENANCE

SERVICE NOTE #1

Removing Tester from Case:

To remove the tester from the case, do NOT remove the top panel screws, but observe the following procedure:

1. Remove four screws in the corners of the card tray and remove the tray.
2. Remove three, 1/2 inch, flat head sheet metal screws from the metal panel that separates the card tray and the tube tester.
3. Remove three, 3/4 inch, oval head screws from the back of the case.
4. The tester can now be removed from the case.

SERVICE NOTE #2

Calibration:

Preliminary

1. Remove the tester from the case as described above.
2. Plug tester into power line and allow it to warm up.
3. Insert the "CALIBRATE" card into the card switch. This card is located at the extreme left end of the card tray.

4. Monitor the power line voltage at the line plug with an accurate AC voltmeter.

5. Set the "LINE ADJUST" knob to indicate the voltage closest to that observed on the AC voltmeter.

6. Set "ZERO ADJUST" knob for zero indication on the tester meter.

7. D. C. Calibration of V. T. V. M.

7. Push button #2. The tester meter should indicate at 50 on the top scale. If adjustment is required, turn the D. C. Calibrate potentiometer located at the back of the meter case to obtain the correct deflection.

A. C. Calibration of V. T. V. M.

8. Push button #1. The tester meter should indicate at the "LINE TEST" point. If adjustment is required turn the AC calibrate potentiometer located nearest the edge of the chassis toward the card switch, to obtain correct deflection.

9. Remove "CALIBRATE" card from switch.

SERVICE NOTE #3

Short Test Sensitivity Adjustment:

1. Insert 12BY7 card.

2. Connect a 10 megohm resistor from pin 1 to pin 2 (grid to cathode) on any convenient tube test socket.

3. Turn short test potentiometer until the top four (4) neon short lamps just flicker on and off. The bottom lamp will remain dark.

   NOTE: The Short Test potentiometer is located on the chassis beside the AC Calibrate potentiometer.

4. Connect a 20 megohm resistor in place of the 10 megohm used above. All lamps should be completely out. If glow is observed repeat steps 2 and 3 above.

SERVICE NOTE #4

Removing Card Switch Cover:

1. Disconnect line cord.

2. Remove the Phillips head screws located on end side of the card switch cover.

3. Lift the back of the cover, slide toward the front to clear the card guide and lift off.

   (The black reject knob must be down for cover to slide under the card guide.)

SERVICE NOTE #5

Adjusting top micro-switch:

Move a card slowly back and forth in the switch through the last 1/4 inch of travel. An audible light "click" of the micro-switch should be heard. If no "click" is heard, the micro-switch is probably set too far back on its supporting bracket.

Readjust as follows:

1. Disconnect line cord.

2. Remove card switch cover as described in Service Note #4 above.

3. Loosen, slightly, the two screws which secure the micro-switch to its bracket at the top of the card switch. Carefully position the micro-switch until the card actuates it as indicated by the "CLICK".

4. Tighten the mounting screws. Recheck the action with a card.

5. Plug tester into power source and turn on.

   Check that card now properly actuates switch.

   CAUTION: LINE VOLTAGE IS PRESENT ACROSS THE MICRO-SWITCH CONNECTIONS.

6. Be sure that the card releases easily when the reject knob is pushed. If it does not, the micro-switch has been set in too close. Readjust slightly as described above until proper operation is achieved.

7. Replace card switch cover.

SERVICE NOTE #6

Captive Card:

If a card will not come out of switch when rejected, use the following procedure:

1. Actuate switch with card and push reject knob again.
2. If card still doesn't release; pull the line cord from the power source and remove the card switch cover, as described in Service Note #4.
3. Inspect the tops of the contact pins as seen through the holes. One of these pins has moved up above its normal position through one of the holes in the card.
4. Using a small screw driver, or other suitable tool, carefully push the pin down until it clears the card. The card should now slide easily out of the switch.
5. Plug the line cord into the power source and turn ON.
6. Re-activate the switch several times with the same card. The card should be free to slide out each time the reject knob is pushed.
7. When operation is normal, replace card switch cover.

SERVICE NOTE #7

12AU7 Filament Wiring:

The wire from terminal #7 of the VTVM transformer to pins 4 and 5 of the 12AU7 tube socket is made of nichrome wire. It has a nominal resistance of approximately 5 ohms.

If this wire needs to be replaced in the field, it is recommended that standard hook-up wire with a 5 ohm 1/2 watt resistor, in series, be used, since it is difficult to properly solder nichrome wire with conventional methods and tools.

SERVICE NOTE #8

VTVM Voltage Measurements:

Pin No.	Volts DC	Pin No.	Volts DC
1	300	6	300
2	196	7	196
3	200	8	200

All DC voltages measured with a 20,000 ohms/volt meter using the center tap of the "ZERO ADJUST" control as negative reference.

Filament voltage at 12AU7 socket measured from pins 4 and 5 to pin 9 is approximately 6.0 V. A. C. (See Service Note #7).

Voltages measured during servicing should be within ± 10% of average values listed above.

TROUBLE SHOOTING

Symptom	Procedure
V. T. V. M. Zero Adjust inoperative	Replace 12AU7 tube. If still inoperative, check voltages in V. T. V. M. circuit. (See schematic and Service Note #8).
No reading when #1 button is pushed. with "CALIBRATION" card in switch, normal reading when #2 button pushed.	Check 1N34A diodes in peak-to-peak detector circuit. Front to back resistance ratio of these diodes should be at least 100 to 1. Measurements can be made with diodes in circuit and line cord disconnected.
No reading when #2 button is pushed with "CALIBRATION" card in switch. Normal reading when #1 button is pushed.	Replace 1N91 bias rectifier. Also check the four 20 mfd. 450 volt capacitors in the insulated can, and the 40 mfd 250 volt tubular capacitor for excessive leakage.
No reading when #1 or #2 button is pushed with "CALIBRATION" card or a tube test card in switch. VTVM ZERO ADJUST NORMAL.	Tighten or replace 150 watt lamp.
Consistently high or off scale readings during tube "Quality" tests (#2 button).	An occasional "hot" tube will read well up scale or even off scale, but consistently high "Quality" readings indicate possible damage to one or more of the meter shunt resistors. These should be checked with an ohmmeter. These resistors are mounted on the lower card switch terminal strip.
Card does not actuate card switch when fully inserted.	Check that tester is turned on and card is inserted properly with printed side up. If trouble persists, remove card switch cover and check for line voltage across the terminals of the micro-switch. If line voltage is present readjust micro-switch as detailed in Service Note #4. If line voltage is not present remove tester from case and check continuity of Solenoid and micro-switch control circuit.

SPARE PARTS LIST FOR 121

Part No.	Description
660-110	Meter
2910-17	Button: push, black, #1 switch
2910-18	Button: push, black, #2 switch
2910-19	Button: push, black, #3 switch
2910-20	Button: push, red, #4 switch
3085-77	Capacitor, electrolytic 20-20-20-20 mfd. 450 v
3110-7	Capacitor, ceramic .005 mfd.
3523-109	Contact: strip
3870-2	Crystal: 1N34, Sylvania
3870-37	Crystal: 1N91, G. E.
12270-26	Lamp, NE2, neon
12270-37	Lamp, 150 watt 120 volt
40300-503	Potentiometer: 50K ohm $\frac{1}{2}$ watt
40500-104	Potentiometer:100K ohm $\frac{1}{2}$ watt
40500-503	Potentiometer: 50K ohm $\frac{1}{2}$ watt
18150-21	Rectifier, seleniun, input 260 VRMS output current 20 MA
18150-44	Rectifier, seleniun
19360-1	Solenoid, #431-1 Dormeyer
19910-128	Switch, push button
19912-363	Switch, rotary, 1 sect. 12 pos.
20800-207	Transformer: power
20800-211	Transformer: isolation
20875-107	Tube, 5963

MODEL 121
HAND PUNCH CARD SET (Style No. 100-552)

Description:

The Hickok hand punch card set contains fifty printed blank cards, one steel hand punch, two data request cards, and an index of available cards, as shown in Figure 1. Additional cards may be ordered under the Hickok Part No. 3122-93.

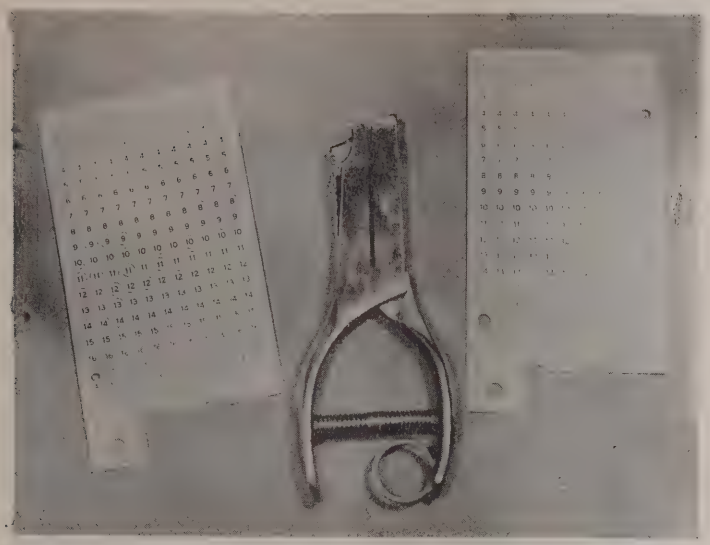

Figure 1.

The Hickok Hand Punch Card Set

Preparation of Cards:

The Hickok CARDMATIC switch is designed so the unpunched areas in a test card close the contacts. Therefore, all the circles are punched in the card except the ones that close circuit switches.

1. Transfer the test data to the blank card and mark an "X" on the holes not to be punched as in Figure 2.

Figure 2.

Marking the blank card for punching

2. A convenient way to locate the correct circles on the card is to find the desired lettered row and mark the circles that are not to be punched in that lettered row.

Punching the Card:

1. Locate the unmarked circle exactly in the die hole of the hand punch and punch the hole as shown in Figure 3.

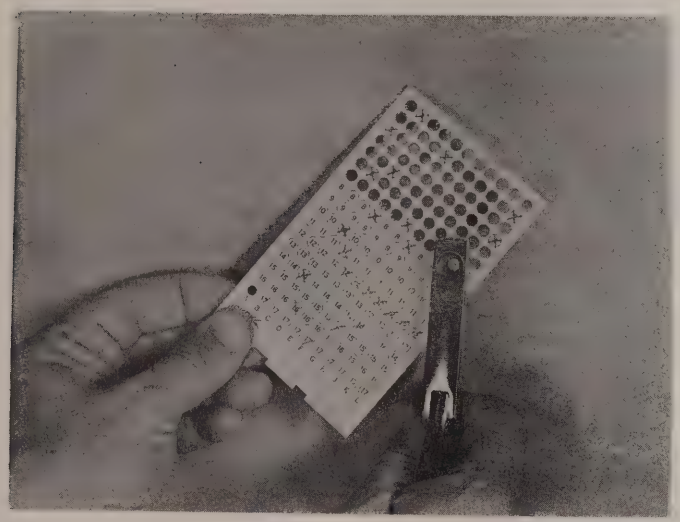

Figure 3.

Center each unmarked circle exactly in the die hole before punching.

Obtaining Data:

1. Check the "Index of Available Cards" booklet, which is furnished with this kit.

2. If the desired test or tests are not available as standard cards, information for hand punching these cards may be obtained by mailing enclosed "Data Request" post card. Be sure to state model and serial number so proper data can be supplied.

Replacing Broken Cards:

1. Place the parts of the broken card over a blank card and mark the holes to be punched.

2. Center the marked circles in the die hole of the hand punch and punch the holes.

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10514 DUPONT AVE., CLEVELAND 8, OHIO

INDEX OF AVAILABLE CARDS

MODEL 121

THE HICKOK ELECTRICAL INSTRUMENT COMPANY
10514 Dupont Avenue - Cleveland 8, Ohio

Code No. 2490-336

MODEL 121 TUBE TEST DATA CARDS
Group 104 - Inactive Types (50 Cards for 39 Tubes)

Code No. 3122-102

Tube Type	No. of Cards	Tube Type	No. of Cards
7A4	1	7Y4	1
7A5	1	7Z4	1
7A6	1	12A6	1
7A7	1	12J7	1
7A8	2	12K7	1
7B4	1	12Q7	2
7B5	1	12SF5	1
7B7	1	14A4	1
7C4	1	14A5	1
7C6	2	14A7 (12B7)	1
7C7 (1273)	1	14AF7	1
7F7	1	14B6	2
7G7	1	14B8	2
7J7	2	14C5	1
7K7	2	14C7 (1280)	1
7L7	1	14E6	2
7R7	2	14E7	2
7V7	1	14F7	1
7X6	1	14F8	1
7X7	2		

MODEL 121 TUBE TEST DATA CARDS — Code No. 3122-83

Group 105 - Factory Pack (322 Cards for 223 Tubes and 1 Tester Calibration Card)

TUBE	CARDS	TUBE	CARDS	TUBE	CARDS	TUBE	CARDS
OZ4	1	6AK5	1	6CG8	2	12AU7	3
1AX2	1	6AK6	1	6CH8	2	12AV5	2
1B3	1	6AL5	1	6CL6	1	12AV6	2
1R5	2	6AM8	2	6CM6	1	12AV7	1
1S5	2	6AN8	2	6CM7	2	12AX4	1
1T4	1	6AQ5	1	6CN7	2	12AX7	1
1U4	1	6AQ7	2	6CQ8	2	12AZ7	1
1U5	2	6AS5	1	6CS6	1	12B4	2
1X2	1	6AS8	2	6CS7	2	12BA6	1
2AF4	1	6AT6	2	6CU5	1	12BD6	1
2BN4	1	6AT8	2	6CU6	2	12BE6	2
3AL5	1	6AU4	1	6CU8	2	12BF6	2
3AU6	1	6AU5	2	6DE6	1	12BH7	2
3AV6	2	6AU6	1	6DG6	1	12BL6	1
3BC5	1	6AU8	2	6DQ6	2	12BQ6	2
3BN6	2	6AV5	2	6DT6	2	12BR7	2
3BY6	1	6AV6	2	6H6	1	12BV7	1
3BZ6	1	6AW8	2	6J5	1	12BY7	1
3CB6	1	6AX4	1	6J6	1	12BZ7	1
3CF6	1	6AX5	1	6J7	1	12C5	1
3CS6	1	6BA6	1	6K6	1	12CA5	1
3DT6	2	6BA8	2	6L6	1	12CR6	2
3V4	1	6BC5	1	6S4	2	12CU5	1
4AU6	1	6BC8	1	6SA7	2	12CU6	2
4BC8	1	6BD6	1	6SC7	1	12DQ6	2
4BQ7A	1	6BE6	2	6SJ7	1	12F8	2
4BS8	1	6BF5	1	6SK7	1	12K5	1
4BZ7	1	6BF6	2	6SL7	1	12L6	1
4CB6	1	6BG6	2	6SN7	3	12SA7	2
4DT6	2	6BH6	1	6SQ7	2	12SK7	1
5AM8	2	6BH8	2	6T4	1	12SN7	3
5AN8	2	6BJ6	1	6T8	3	12SQ7	2
5AQ5	1	6BK5	1	6U8	2	12SX7	1
5AS8	2	6BK7A	1	6V3	1	12V6	1
5AT8	2	6BL7	2	6V6	1	12W6	1
5BK7A	1	6BN4	1	6W4	1	12X4	1
5BR8	2	6BN6	2	6W6	1	17DQ6	2
5CG8	2	6BQ6	2	6X4	1	19AU4	1
5CL8	2	6BQ7A	1	6X5	1	19T8	3
5CQ8	2	6BR8	2	6X8	2	25AX4	1
5CZ5	2	6BS8	1	6Y6	1	25BQ6	2
5J6	1	6BU8	2	7AU7	3	25CD6	2
5T8	3	6BX7	2	7C5	1	25CU6	2
5U4G	2	6BY5	1	7F7	1	25DN6	2
5U4GAB	2	6BY6	1	7N7	1	25L6	1
5U8	2	6BY8	2	8AW8A	2	25W4	1
5V4	1	6BZ6	1	8CG7	1	35C5	1
5X8	2	6BZ7	1	12AB5	1	35L6	1
5Y3	2	6BZ8	1	12AD6	2	35W4	1
6AB4	1	6C4	1	12AE6	2	35Y4	1
6AC7	1	6CB5	2	12AF6	1	35Z5	1
6AF4	1	6CB6	1	12AL5	1	50A5	1
6AG5	1	6CD6	2	12AQ5	1	50B5	1
6AG7	1	6CE5	1	12AT6	2	50C5	1
6AH4	2	6CF6	1	12AT7	1	50L6	1
6AH6	1	6CG7	1	12AU6	1	Calibration Card	1

MODEL 121 TUBE TEST DATA CARDS Code No. 3122-86
Group 106 - New Tube Types (50 Cards for 33 Tubes)

Tube Type	No. of Cards	Tube Type	No. of Cards
3AF4A	1	6CH7	1
3BU8	2	6SR7	2
3CE5	1	8CM7	2
3Q4	1	8SN7	3
4BN6	2	9AU7	3
4BU8	2	12AC6	1
4BZ8	1	12BK5	1
4CE5	1	12BN6	2
4CS6	1	12CS6	1
5AV8	2	12SR7	2
5B8	2	17AX4	1
5BQ7A	1	17AV5	2
5BZ7	1	17C5	1
6AS7	1	17CA5	1
6AU7	3	19BG6	2
6AX7	1	35B5	1
6CA5	1		

MODEL 121 TUBE TEST DATA CARDS Code No. 3122-92

Group 107 - New Tube Types (100 Cards for 72 Tubes)

Tube Type	No. of Cards	Tube Type	No. of Cards
1A5	1	6SG7	1
1A7	2	6SH7	1
1AG4	1	6V8	3
1N5	1	7AF7	1
1S4	1	7AG7	1
1V2	1	7B6	2
1V6	2	7B8	2
2T4	1	7E6	2
3A2	1	7F8	1
3BA6	1	7H7	1
3BE6	2	7Q7	2
3Q5	1	7W7	1
3S4	1	12A8	2
5AS4	2	12AG6	1
5AU4	2	12BA7	2
5AW4	2	12CM6	1
5BE8	2	12H6	1
5V6	1	12J5	1
5X4	2	12SC7	1
5Y4	2	12SF7	2
6AL7	2	12SG7	1
6AN4	1	12SH7	1
6AQ6	2	12SJ7	1
6BA7	2	12SL7	1
6BC7	2	19J6	1
6BL4	1	25BK5	1
6DC6	1	25C5	1
6F5	1	25W6	1
6F6	1	25Z6	1
6F8	1	35A5	1
6G6	1	50BK5	1
6K7	1	117L7	2
6Q7	2	117M7	2
6S8	3	117Z3	1
6SF5	1	X155	1
6SF7	2	5879	1

MODEL 121 TUBE TEST DATA CARDS Code No. 3122-95
Group 108 - New Tube Types (100 Cards for 67 Tubes)

Tube Type	No. of Cards	Tube Type	No. of Cards
1J3	1	6CZ5	2
2B3	1	6DA4	1
2CY5	1	6DB5	1
3B2	1	6DK6	1
3BN4	1	6DN6	2
3C2	1	8AU8	2
3CY5	1	8BA8A	2
3DK6	1	8BH8	2
4BA6	1	8BN8	2
4BC5	1	8CN7	2
4BE6	2	8CS7	2
4BX8	1	9CL8	2
4CY5	1	9U8	2
4DK6	1	9X8	2
5BS8	1	10C8	2
5BT8	2	12AY7	1
5CM6	1	12BW4	1
5CM8	2	12CN5	1
5V3	2	12CT8	2
6AN5	1	12D4	1
6AR5	1	12DB5	1
6AZ8	2	12R5	2
6BJ7	2	17CU5	1
6BJ8	2	17D4	1
6BK4	1	17H3	1
6BN8	2	17L6	1
6BT8	2	17R5	2
6BV8	2	18A5	2
6BW4	1	19X8	2
6BX8	1	25AV5	2
6CL8	2	25CA5	1
6CM8	2	25DQ6	2
6CR6	2	35CD6	2
6CY5	1		

MODEL 121 TUBE TEST DATA CARDS Code No. 3122-101
Group 109 - New Tube Types (50 Cards for 32 Tubes)

Tube Type	No. of Cards	Tube Type	No. of Cards
4BZ6	1	12DM5	1
6AJ4	1	12DV8	2
6AM4	1	12DY8	2
6AX8	2	12DZ6	1
6BC4	1	12EA6	1
6BE8	2	12EC8	2
6BW8	2	12EG6	1
6M3	1	12EK6	1
12A4	1	12EL6	2
12AE7	2	12EM6	2
12AJ6	2	12G8	2
12AL8	2	12J8	3
12CX6	1	12U7	1
12DE8	2	17BQ6	2
12DF5	1	25EC6	2
12DL8	2	25F5	1

MODEL 121 Code No. 3122-96

SEMICONDUCTOR TEST DATA CARDS (19 Cards)

Device	Test Cards
PNP Transistor (Entertainment Type)	ENT. TRANS PNP Card 1 of 2 ENT. TRANS PNP Card 2 of 2
NPN Transistor (Entertainment Type)	ENT. TRANS NPN Card 1 of 2 ENT. TRANS NPN Card 2 of 2
PNP Transistor (Power Type)	PWR TRANS PNP Card 1 of 2 PWR TRANS PNP Card 2 of 2
Crystal Diode (Germanium, Silicon)	DIODE COND. TEST DIODE LEAK 10V 0.1 MA DIODE LEAK 50V 0.5 MA DIODE LEAK 100V 1 MA DIODE LEAK 100V 0.1 MA
Power Rectifier (Selenium)	SELENIUM 65 MA SELENIUM 75 MA SELENIUM 100 MA SELENIUM 150 MA SELENIUM 200 MA SELENIUM 250 MA SELENIUM 300 MA OK OVER 30 SEL. 500 MA

HICKOK

MODEL

121

Cardmatic tube tester

This card punching data guide will permit you to set up your Hickok Cardmatic Tube Tester to test the following new tubes.

You can use this guide to punch your own cards through use of the Hickok Card Punch Kit. (Available through Hickok Distributors.)

You can also use this guide to manually set up the Cardmatic Switch through use of the non-conductor punch key supplied with your tester. (See under top cover plate of switch and see your instruction manual.)

Note: Factory punched cards will be available for these tubes. Contact your local Hickok Distributors or factory Parts Department for availability.

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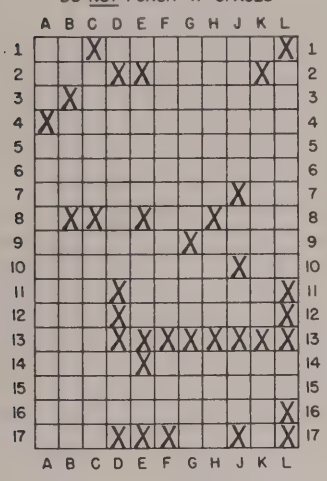
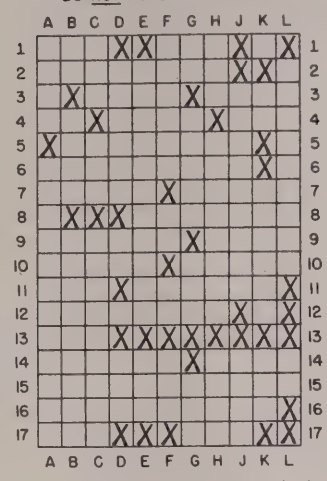
DO NOT PUNCH "X" SPACES



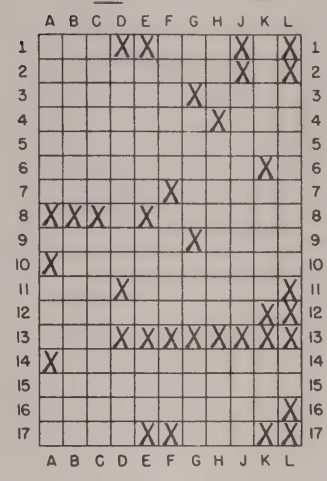
TUBE 12A4
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



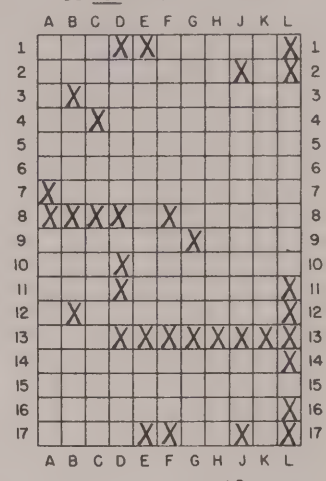
TUBE 12AD7
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



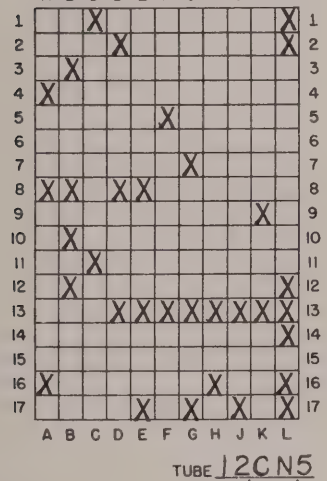
TUBE 12AE7
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



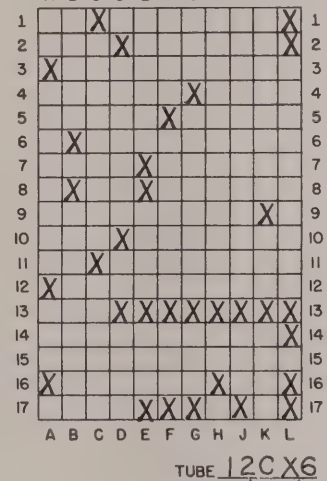
TUBE 12AE7
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



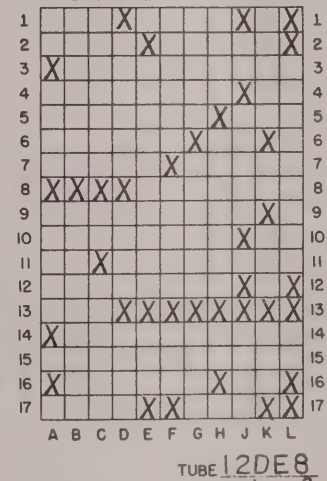
TUBE 12CN5
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



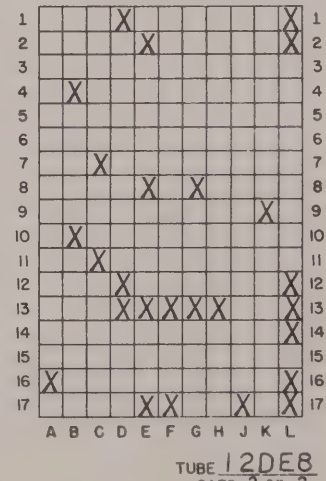
TUBE 12CX6
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



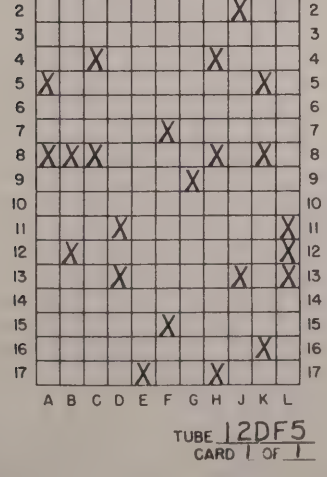
TUBE 12DE8
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



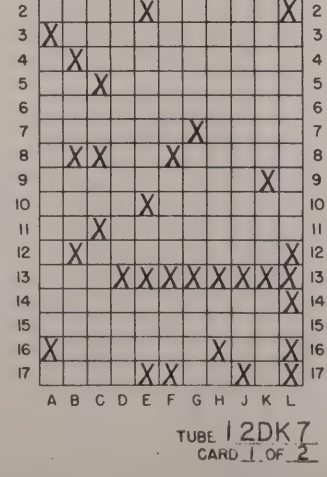
TUBE 12DE8
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



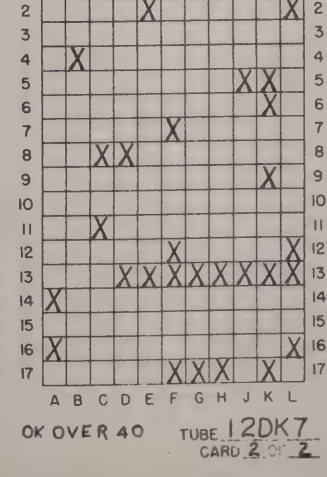
TUBE 12DF5
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



TUBE 12DK7
CARD 1 OF 2

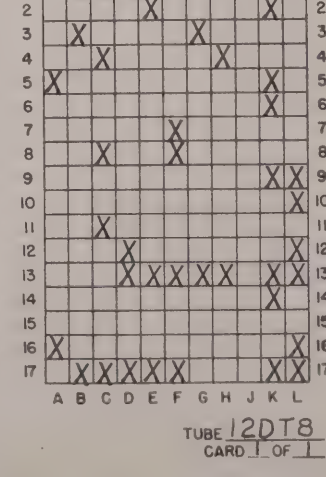
DO NOT PUNCH "X" SPACES



OK OVER 40

TUBE 12DK7
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



TUBE 12DT8
CARD 1 OF 1

NEW TUBES GUIDE 106

HICKOK

MODEL

121

Cardmatic tube tester

This card punching data guide will permit you to set up your Hickok Cardmatic Tube Tester to test the following new tubes.

You can use this guide to punch your own cards through use of the Hickok Card Punch Kit. (Available through Hickok Distributors.)

Note: Factory pre-punched cards are now available for these new tubes through Hickok Distributors.

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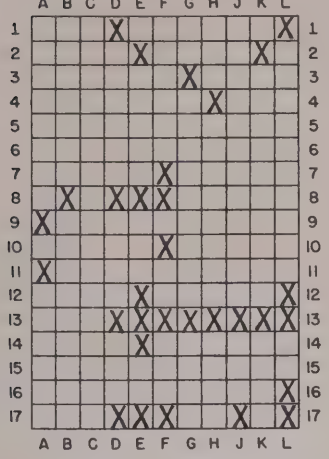
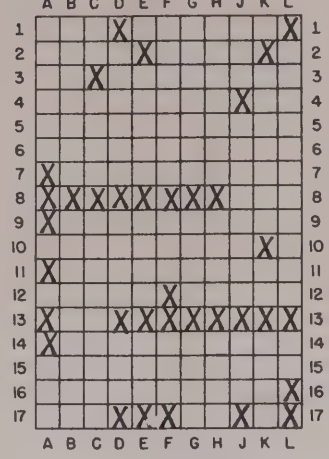
DO NOT PUNCH "X" SPACES



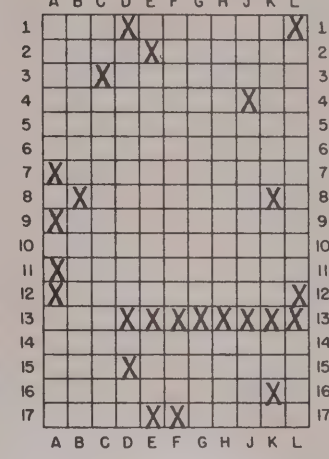
TUBE 10DA7
CARD 1 OF 3

DO NOT PUNCH "X" SPACES



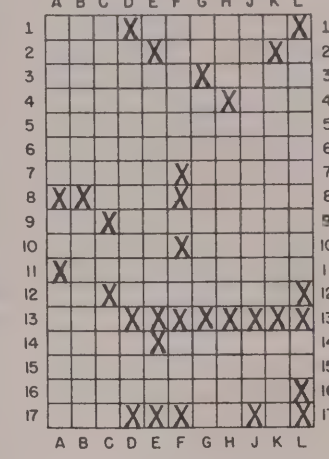
TUBE 10DA7
CARD 2 OF 3

DO NOT PUNCH "X" SPACES



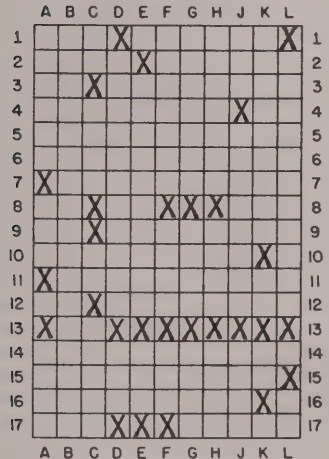
TUBE 10DA7
CARD 3 OF 3

DO NOT PUNCH "X" SPACES



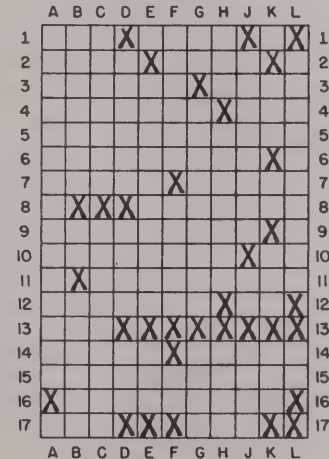
TUBE 10DE7
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



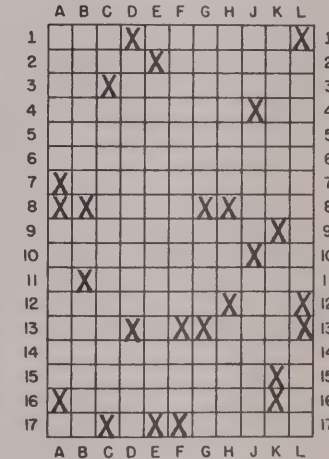
TUBE 10DE7
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



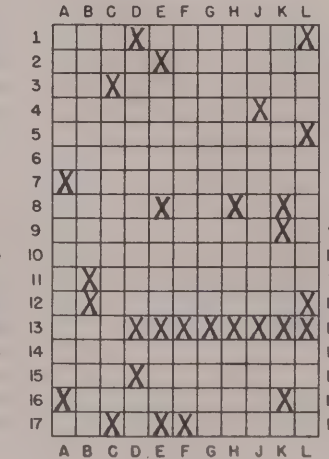
TUBE 11CY7
CARD 1 OF 3

DO NOT PUNCH "X" SPACES



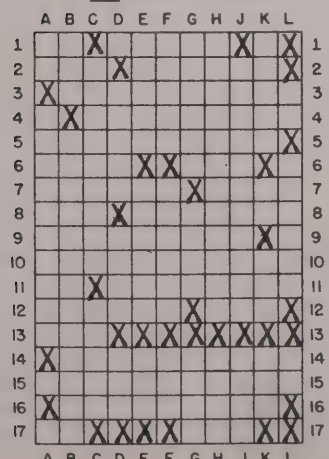
TUBE 11CY7
CARD 2 OF 3

DO NOT PUNCH "X" SPACES



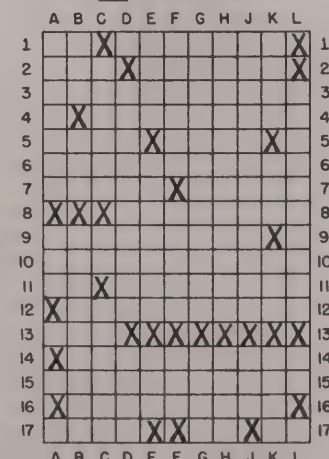
TUBE 11CY7
CARD 3 OF 3

DO NOT PUNCH "X" SPACES



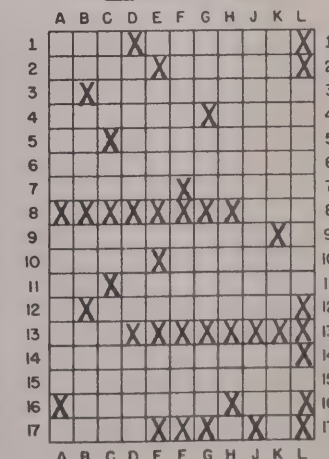
TUBE 12AJ6
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



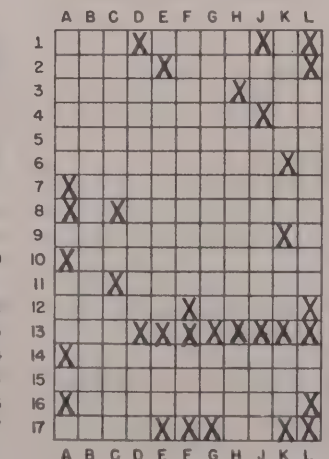
TUBE 12AJ6
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



TUBE 12AL8
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



TUBE 12AL8
CARD 2 OF 2

NEW TUBES GUIDE 105

HICKOK

MODEL

121

Cardmatic tube tester

This card punching data guide will permit you to set up your Hickok Cardmatic Tube Tester to test the following new tubes.

You can use this guide to punch your own cards through use of the Hickok Card Punch Kit. (Available through Hickok Distributors.)

Note: Factory pre-punched cards are now available for these new tubes through Hickok Distributors.

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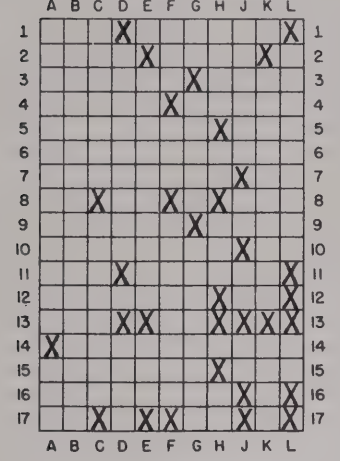
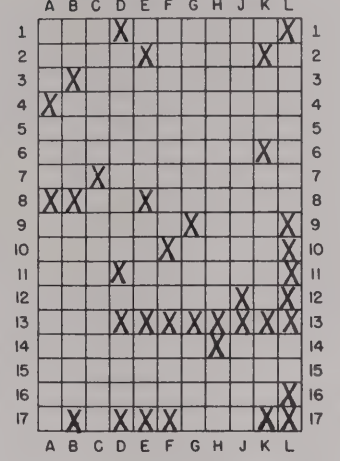
DO NOT PUNCH "X" SPACES



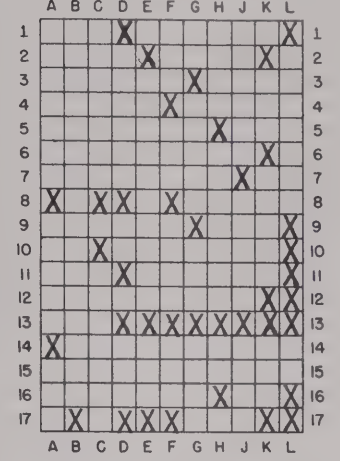
TUBE 6EB8
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



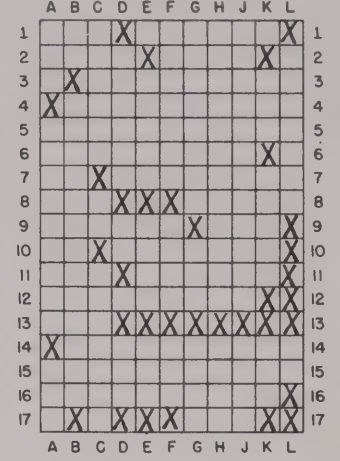
TUBE 6EB8
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



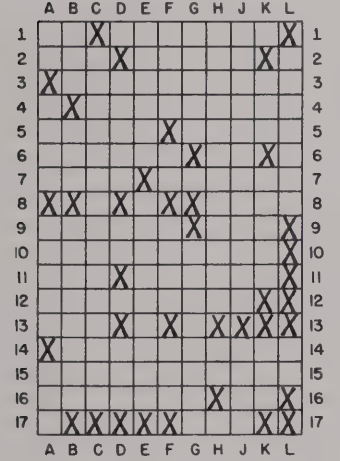
TUBE 6EH8
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



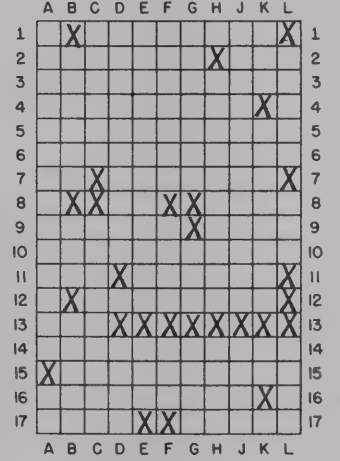
TUBE 6EH8
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



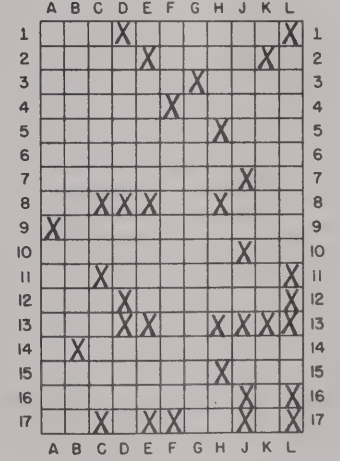
TUBE 6EW6
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



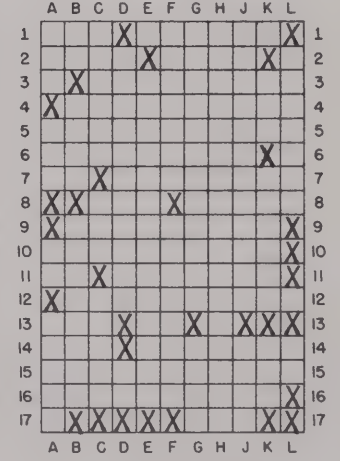
TUBE 6M3
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



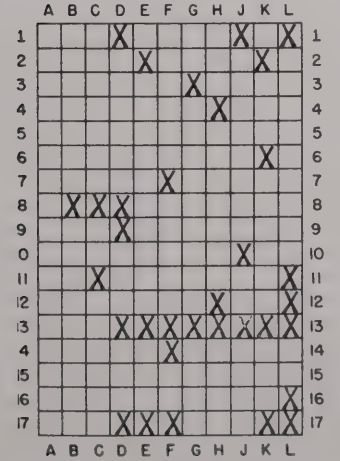
TUBE 8CX8
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



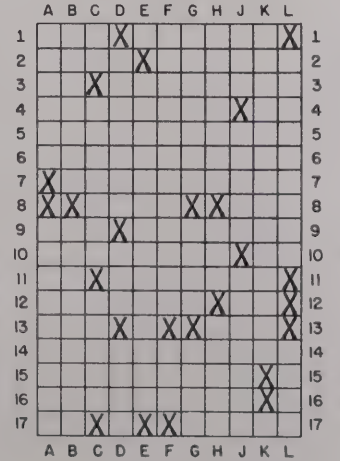
TUBE 8CX8
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



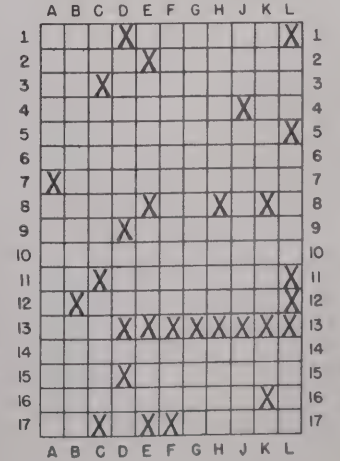
TUBE 8CY7
CARD 1 OF 3

DO NOT PUNCH "X" SPACES



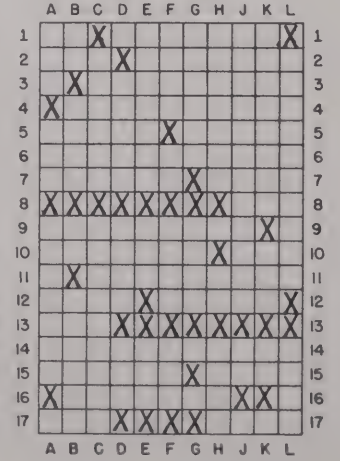
TUBE 8CY7
CARD 2 OF 3

DO NOT PUNCH "X" SPACES



TUBE 8CY7
CARD 3 OF 3

DO NOT PUNCH "X" SPACES



TUBE 11C5
CARD 1 OF 1

NEW TUBES GUIDE 104

HICKOK

MODEL

121

Cardmatic tube tester

This card punching data guide will permit you to set up your Hickok Cardmatic Tube Tester to test the following new tubes.

You can use this guide to punch your own cards through use of the Hickok Card Punch Kit. (Available through Hickok Distributors.)

Note: Factory pre-punched cards are now available for these new tubes through Hickok Distributors.

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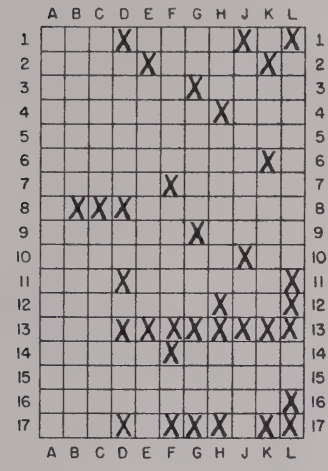
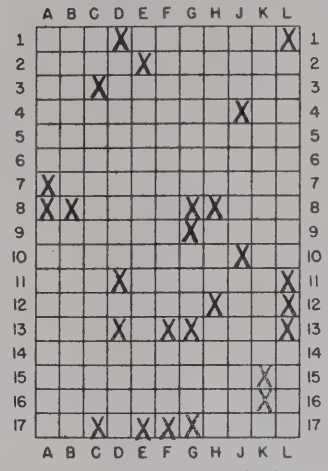
DO NOT PUNCH "X" SPACES



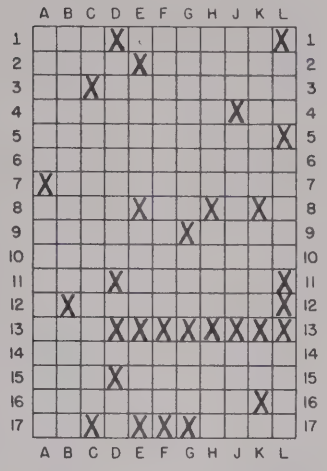
TUBE 6CY7
CARD 1 OF 3

DO NOT PUNCH "X" SPACES



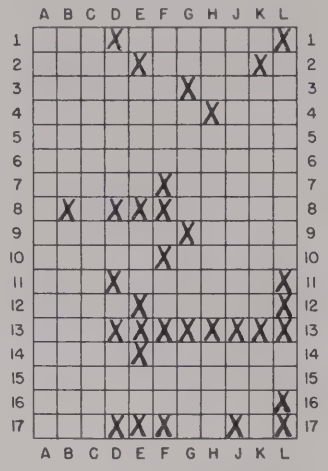
TUBE 6CY7
CARD 2 OF 3

DO NOT PUNCH "X" SPACES



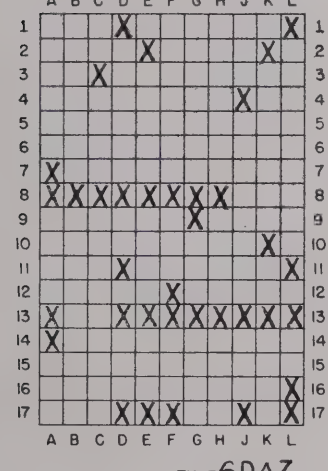
TUBE 6CY7
CARD 3 OF 3

DO NOT PUNCH "X" SPACES



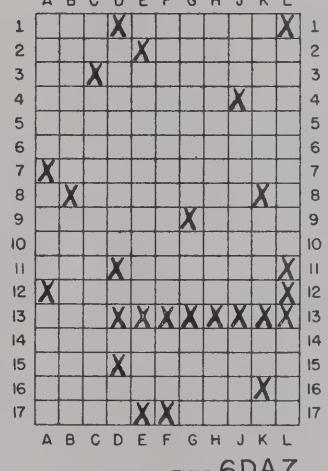
TUBE 6DA7
CARD 1 OF 3

DO NOT PUNCH "X" SPACES



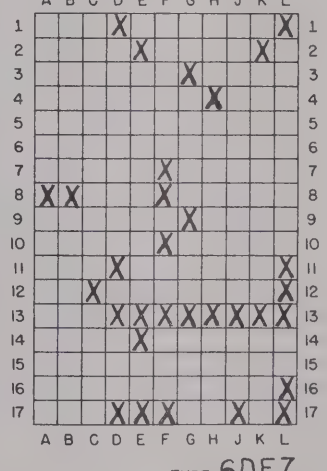
TUBE 6DA7
CARD 2 OF 3

DO NOT PUNCH "X" SPACES



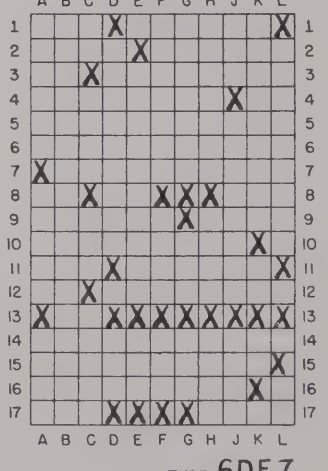
TUBE 6DA7
CARD 3 OF 3

DO NOT PUNCH "X" SPACES



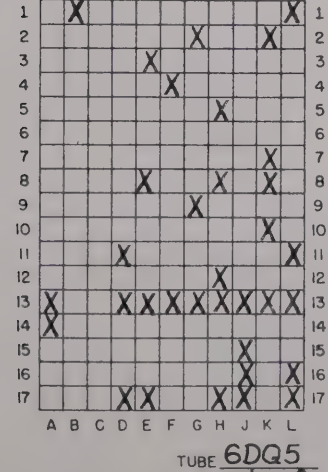
TUBE 6DE7
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



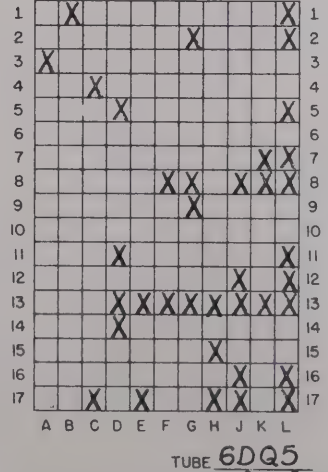
TUBE 6DE7
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



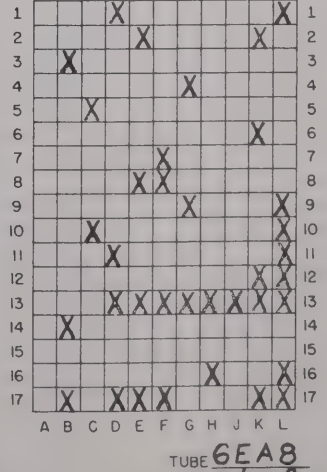
TUBE 6DQ5
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



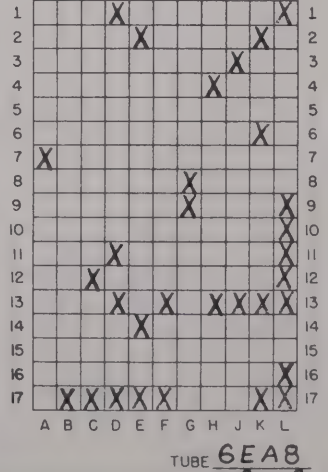
TUBE 6DQ5
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



TUBE 6EA8
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



TUBE 6EA8
CARD 2 OF 2

NEW TUBES GUIDE 103

HICKOK

MODEL

121

Cardmatic tube tester

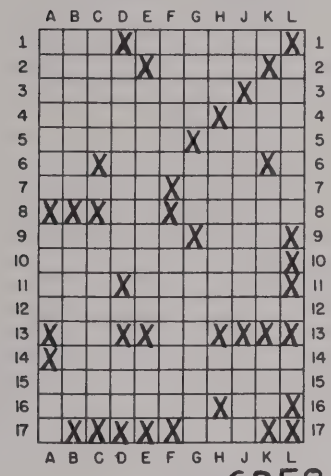
This card punching data guide will permit you to set up your Hickok Cardmatic Tube Tester to test the following new tubes.

You can use this guide to punch your own cards through use of the Hickok Card Punch Kit. (Available through Hickok Distributors.)

Note: Factory pre-punched cards are now available for these new tubes through Hickok Distributors.

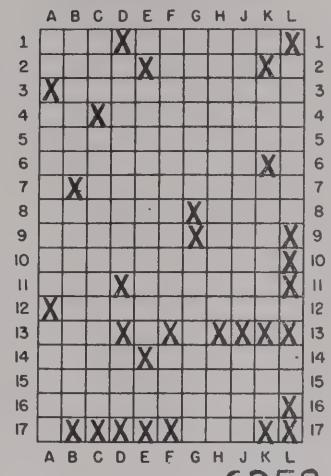
Copyright 1958, The Hickok Electrical Instrument Company, Cleveland 8, Ohio.

DO NOT PUNCH "X" SPACES



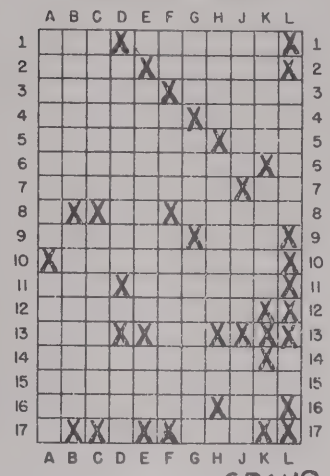
TUBE 6BE8
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



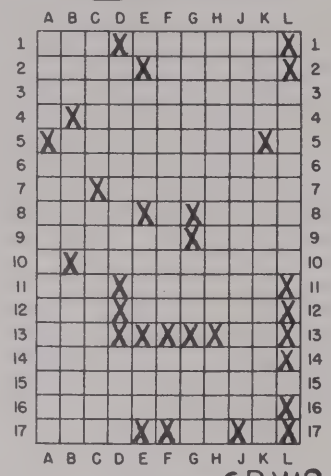
TUBE 6BE8
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



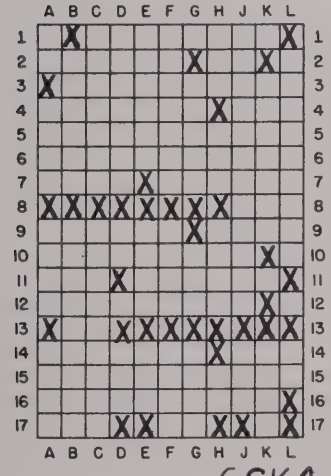
TUBE 6BW8
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



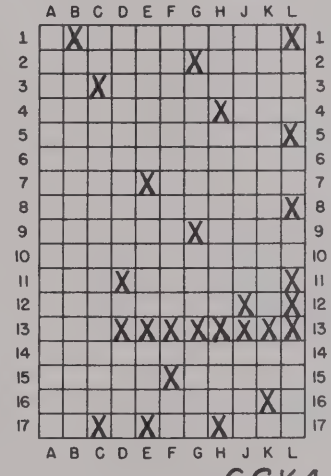
TUBE 6BW8
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



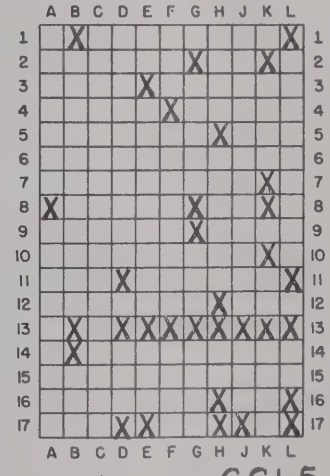
TUBE 6CK4
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



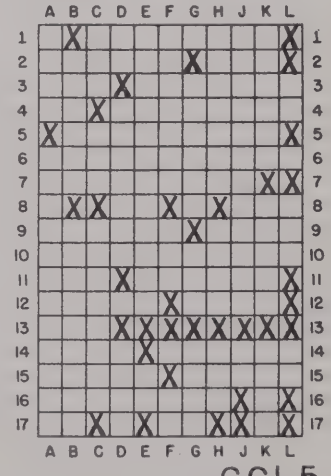
TUBE 6CK4
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



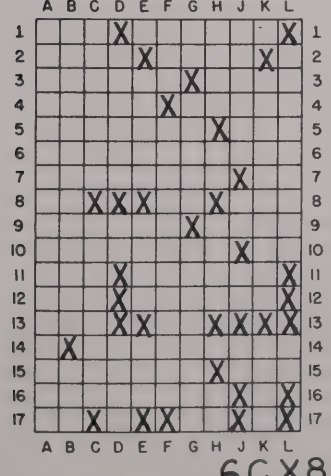
TUBE 6CL5
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



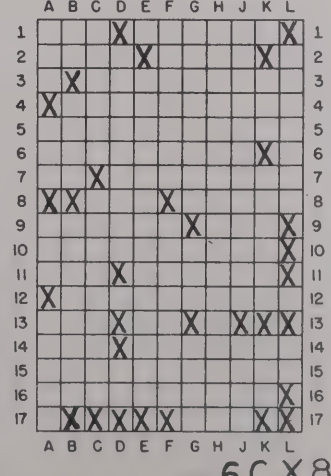
TUBE 6CL5
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



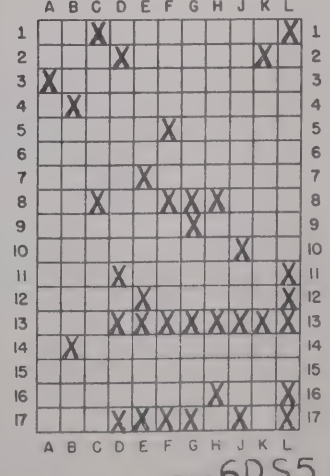
TUBE 6CX8
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



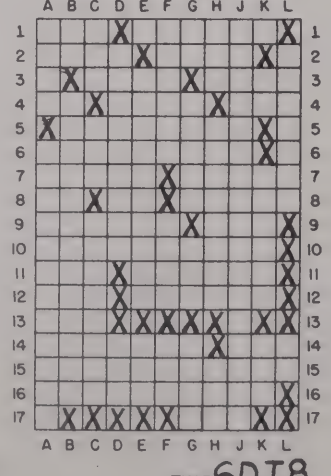
TUBE 6CX8
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



TUBE 6DS5
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



TUBE 6DT8
CARD 1 OF 1

NEW TUBES GUIDE 102

HICKOK

MODEL

121

Cardmatic tube tester

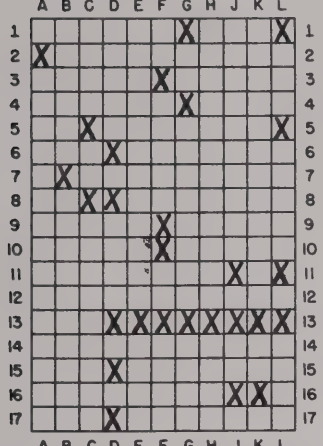
This card punching data guide will permit you to set up your Hickok Cardmatic Tube Tester to test the following new tubes.

You can use this guide to punch your own cards through use of the Hickok Card Punch Kit. (Available through Hickok Distributors.)

Note: Factory pre-punched cards are now available for these new tubes through Hickok Distributors.

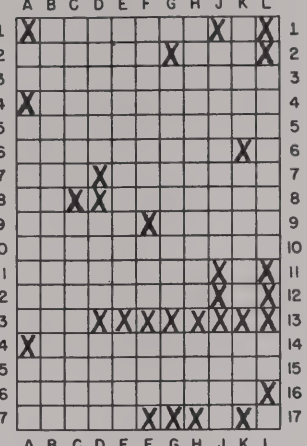
Copyright 1958, The Hickok Electrical Instrument Company, Cleveland 8, Ohio.

DO NOT PUNCH "X" SPACES



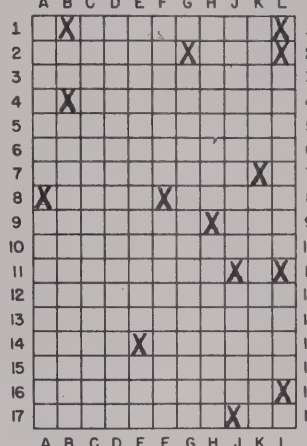
TUBE 1DN5
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



TUBE 1DN5
CARD 2 OF 2

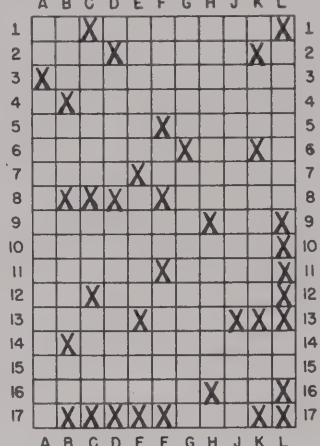
DO NOT PUNCH "X" SPACES



OK OVER 40

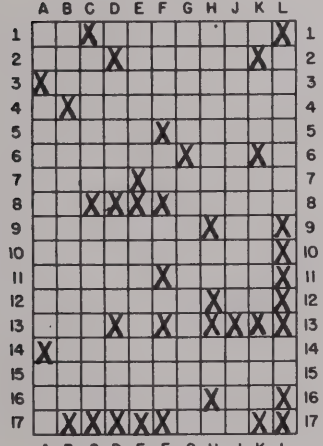
TUBE 1G3
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



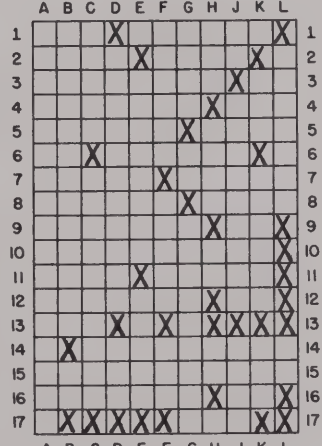
TUBE 4BZ6
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



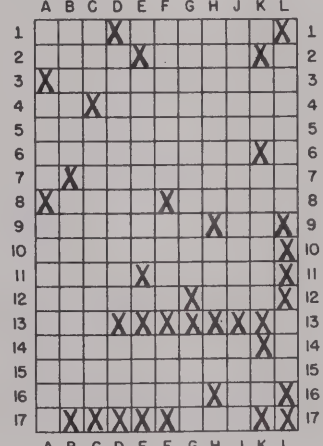
TUBE 4DE6
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



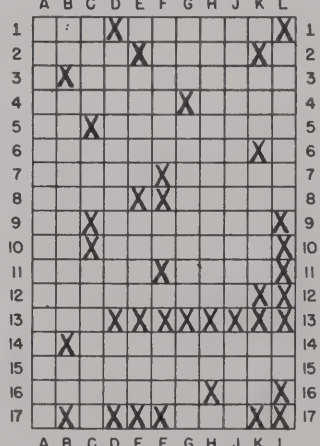
TUBE 5DH8
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



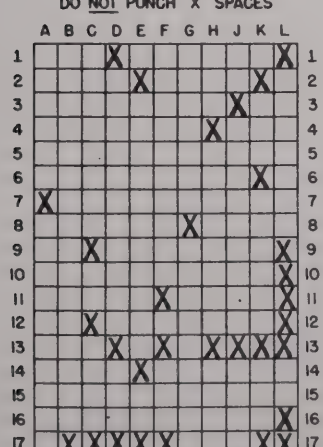
TUBE 5DH8
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



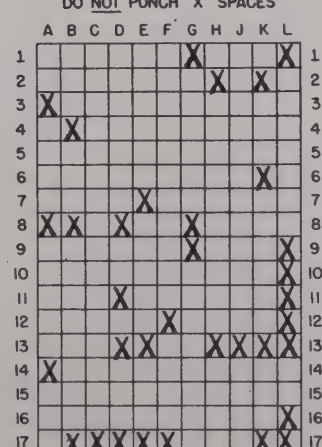
TUBE 5EA8
CARD 1 OF 2

DO NOT PUNCH "X" SPACES



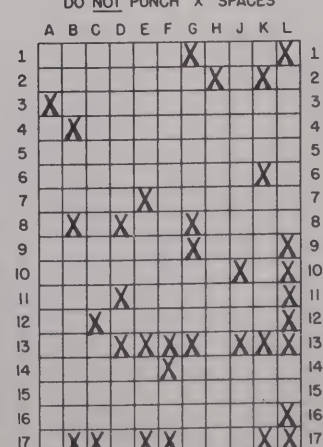
TUBE 5EA8
CARD 2 OF 2

DO NOT PUNCH "X" SPACES



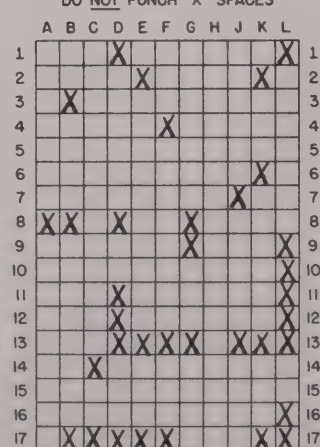
TUBE 6AJ4
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



TUBE 6AM4
CARD 1 OF 1

DO NOT PUNCH "X" SPACES



TUBE 6BC4
CARD 1 OF 1

NEW TUBES GUIDE 101

ALT.	DRAWING NUMBER
C	916W

PIN SELECTOR

PUSHBUTTON SWITCH-CONTACT LAYOUT

NOTES:
1. UNLESS OTHERWISE INDICATED, CAPACITANCES ARE SHOWN IN MICRO-FARADS (μFD), RESISTANCES ARE SHOWN IN OHMS (Ω) ±5%, 1/2 W K=1000 Ω, M = MEGOHMS
2. + = NO CONNECTION
   ✦ = CONNECTION
3. SWITCHES SHOWN FROM KNOB END SET AT OFF POSITION

BOTTOM DECK TOP DECK
CARD SWITCHES

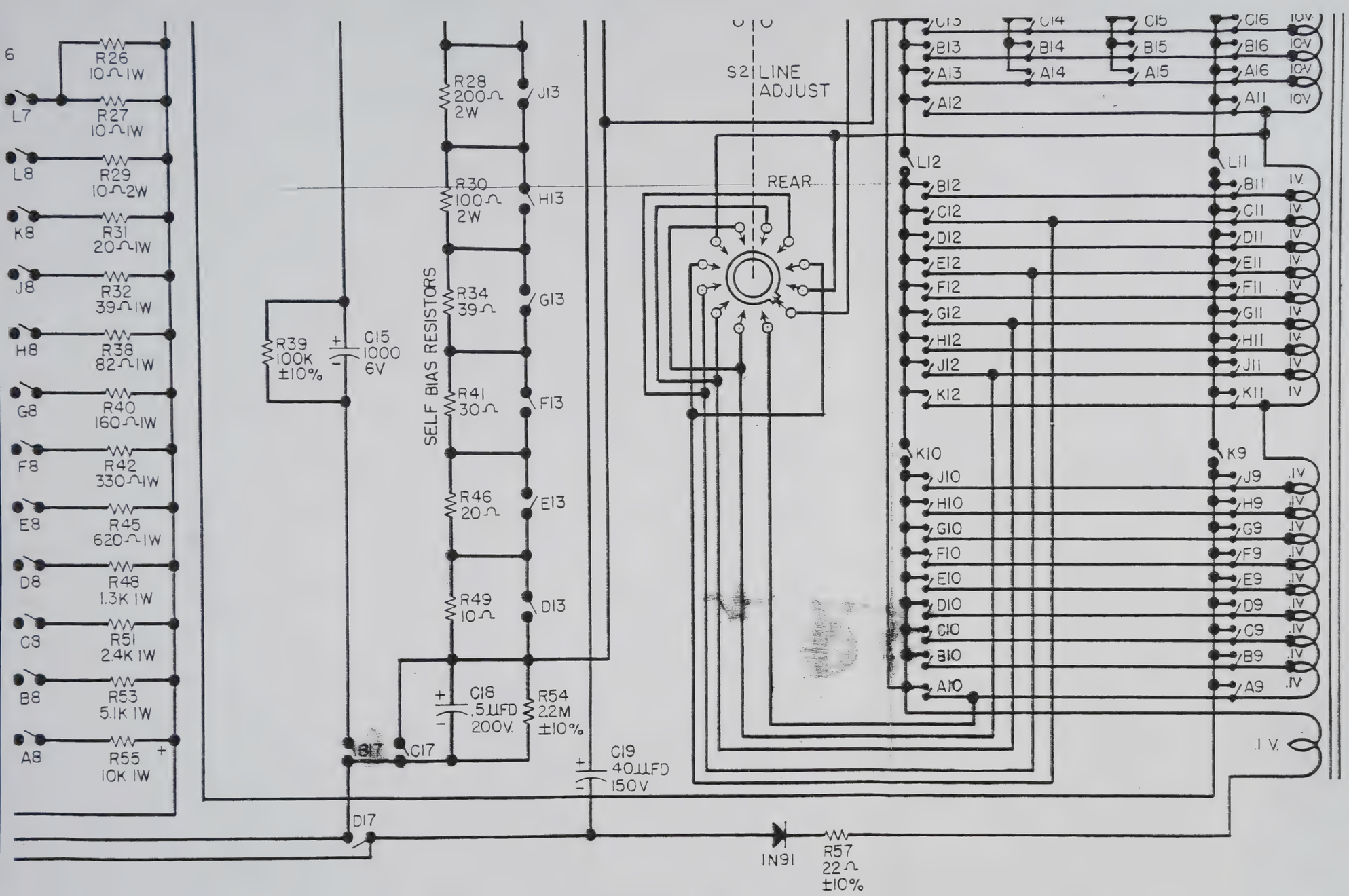
NO.	ALTERATION	BY	APP'D	DATE
C	21417	RB	LAT	11-7-59
B	18805-18905	LD		7-17-58
A	18627-18692	RN		2-20-58

TUBE TESTER - MODEL 121
SCHEMATIC-WIRING DIAGRAM

DRAWN & TRACED	CHECKED	APP'D	DATE
LDD			1-15-58

DRAWING NUMBER 916W

THE HICKOK ELECTRICAL INSTRUMENT CO.
CLEVELAND, OHIO



TUBE TESTER - MODEL 121

SCHEMATIC-WIRING DIAGRAM

DRAWN & TRACED	CHECKED	APP'D	DATE
LDD			1-15-58

DRAWING NUMBER

916W

THE HICKOK ELECTRICAL INSTRUMENT CO.
CLEVELAND, OHIO

R71
7.5M
C10
.005
R16
270K
±10%
R12
47K
±10%
R13
50K
V.T.V.M. ZERO
ADJUST
R60-10K,1W
±10%
0V
SENSITIVITY
ADJUST
R14
50K
250V.
1/2(16Y1)
R35
5Ω
NICHROME
WIRE
UPPER
MICRO-
SWITCH
LOWER
MICRO-
SWITCH
L1
.C. POWER SUPPLY FILTER
R18
1K 2W
±10%
R19
1K 2W
±10%
R20
47Ω
±10%
16J1
K6
R22
470K
C11
20
450V.
C12
20
450V.
C13
20
450V.
C14
20
450V.
K2
L2
R21
100K
±10%
NE-2
K5
115V
R23
390Ω
2W
L13
R25
300Ω
2W
K13
R28
200Ω
2W
J13
R30
100Ω
2W
H13
R34
39Ω
G13
R41
30Ω
F13
SELF BIAS RESISTORS
R26
10Ω 1W
R27
10Ω 1W
R29
10Ω 2W
R31
20Ω 1W
R32
39Ω 1W
R38
82Ω 1W
R40
160Ω 1W
L7
L8
K8
J8
H8
G8
R39
100K
±10%
C15
1000
6V
FRONT
S2 LINE
ADJUST
REAR
L14
L15
K14
K15
J14
J15
H14
H15
G14
G15
F14
F15
E14
E15
D14
D15
C13
C14
C15
B13
B14
B15
A13
A14
A15
A12
G16
F16
E16
D16
C16
B16
A16
A11
10V
L12
B12
C12
D12
E12
F12
G12
H12
J12
K12
K10
J10
L11
B11
C11
D11
E11
F11
G11
H11
J11
K11
1V
K9
J9

NOTES:

1. UNLESS OTHERWISE INDICATED, CAPACITANCES ARE SHOWN IN MICRO-FARADS (μFD), RESISTANCES ARE SHOWN IN OHMS (Ω), ±5%, 1/2 W. K = 1000 Ω, M = MEGOHMS.
2. + = NO CONNECTION
   ✦ = CONNECTION
3. SWITCHES SHOWN FROM KNOB END SET AT OFF POSITION.

BOTTOM DECK
TOP DECK
CARD SWITCHES

ALT.	DRAWING NUMBER
C	916W

300 V. D.C.

C1 .005
R70 30M
C3 .005
C6 .005
C7 .005
R71 7.5M
C10 .005
C9 .005
R16 270K ±10%
C2 200V .1 MFD
5963
196 V. D.C.
196 V. D.C.
VACUUM TUBE VOLT METER
200 V.D.C.
200 V.D.C.
D.C. CAL.
R10 1.5K
R9 470Ω
R11 47K
R13 50K
R12 47K ±10%
V.T.V.M. ZERO ADJUST
R60-10K, 1W ±10%
0V
L3

R3 100K ±10%
R5 47K ±10%
R7 100K ±10%
C5 20 250V.
C8 20 250V.
SHORT TEST SENSITIVITY ADJUST
R14 50K
1/2(16Y1)
1/2(16Y1)
R1 47Ω ±10%
135V
6.3V
R35 5Ω NICHROME WIRE
115V
ISOLATION TRANSFORMER
G.E. 150W
SOLENOID
UPPER MICRO-SWITCH
LOWER MICRO-SWITCH
L1

D.C. POWER SUPPLY FILTER
R18 1K 2W ±10%
R19 1K 2W ±10%
R20 47Ω ±10%
16J1
K6
R22 470K
C11 20 450V.
C12 20 450V.
C13 20 450V.
C14 20 450V.
R23 390Ω 2W
L13

K2
L2
R21 100K ±10%
K5
NE-2
115V

L15
K14 K15
J14 J15
H14 H15
G14 G15
F14 F15
E14 E15
G16
F16
E16
10V

FRONT

NOTES:

1. UNLESS OTHERWISE INDICATED, CAPACITANCES ARE SHOWN IN MICRO-FARADS (μFD), RESISTANCES ARE SHOWN IN OHMS (Ω), ±5%, 1/2 W. K = 1000 Ω, M = MEGOHMS.
2. + = NO CONNECTION.
   ✦ = CONNECTION
3. SWITCHES SHOWN FROM KNOB END SET AT OFF POSITION.

SI-A
1 LINE TEST

SI-C
3 GAS TEST

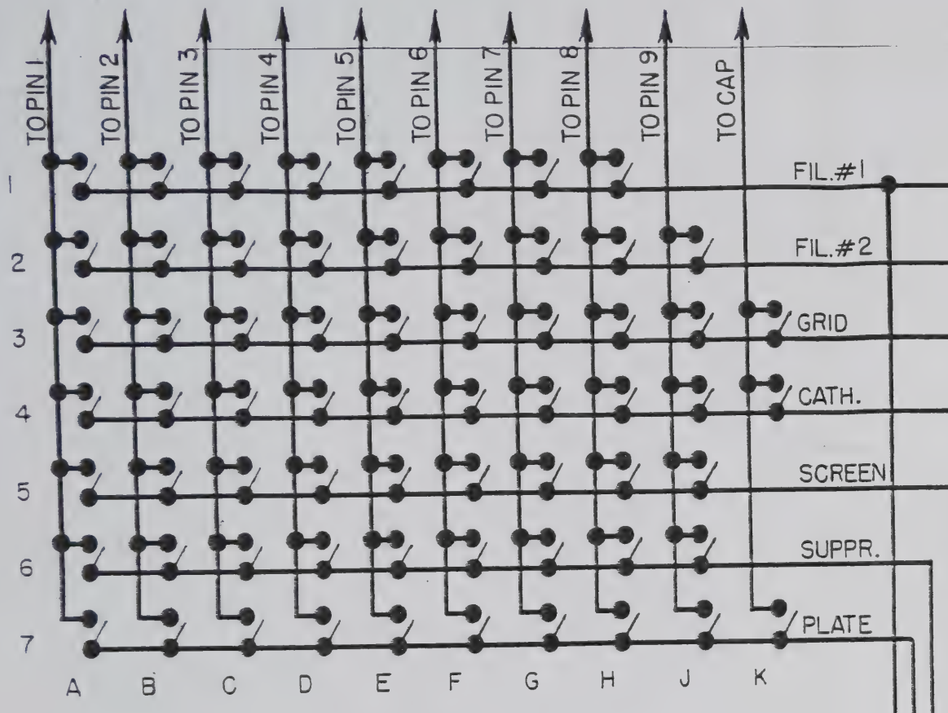
SI-D
4 DUAL TESTS

A.C. CAL.
R33 100K
R36 330K ±10%
PEAK TO PEAK DETECTOR
C16 10 25V.
J1
R43 22K ±10%
IN34
C17 10 25V
NE-2
R59 470Ω
SIGNAL 42V
E17
R44 10K 1W
R37 100K
L5
L9
R56 330Ω ±10%
L10

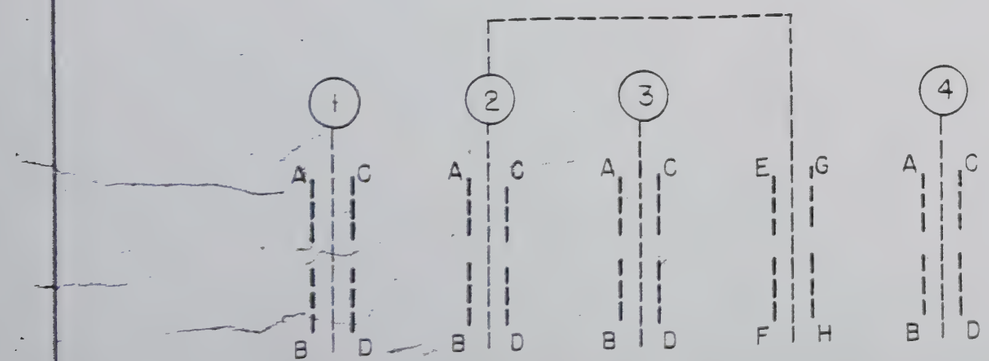
METER SHUNTS
L6 R26 10Ω 1W
L7 R27 10Ω 1W
L8 R29 10Ω 2W
K8 R31 20Ω 1W
J8 R32 39Ω 1W
H8 R38 82Ω 1W
G8 R40 160Ω 1W
F8 R42 330Ω 1W
E8 R45 620Ω 1W
D8 R48 1.3K 1W
C8 R51 2.4K 1W
B8 R53 5.1K 1W
A8 R55 10K 1W

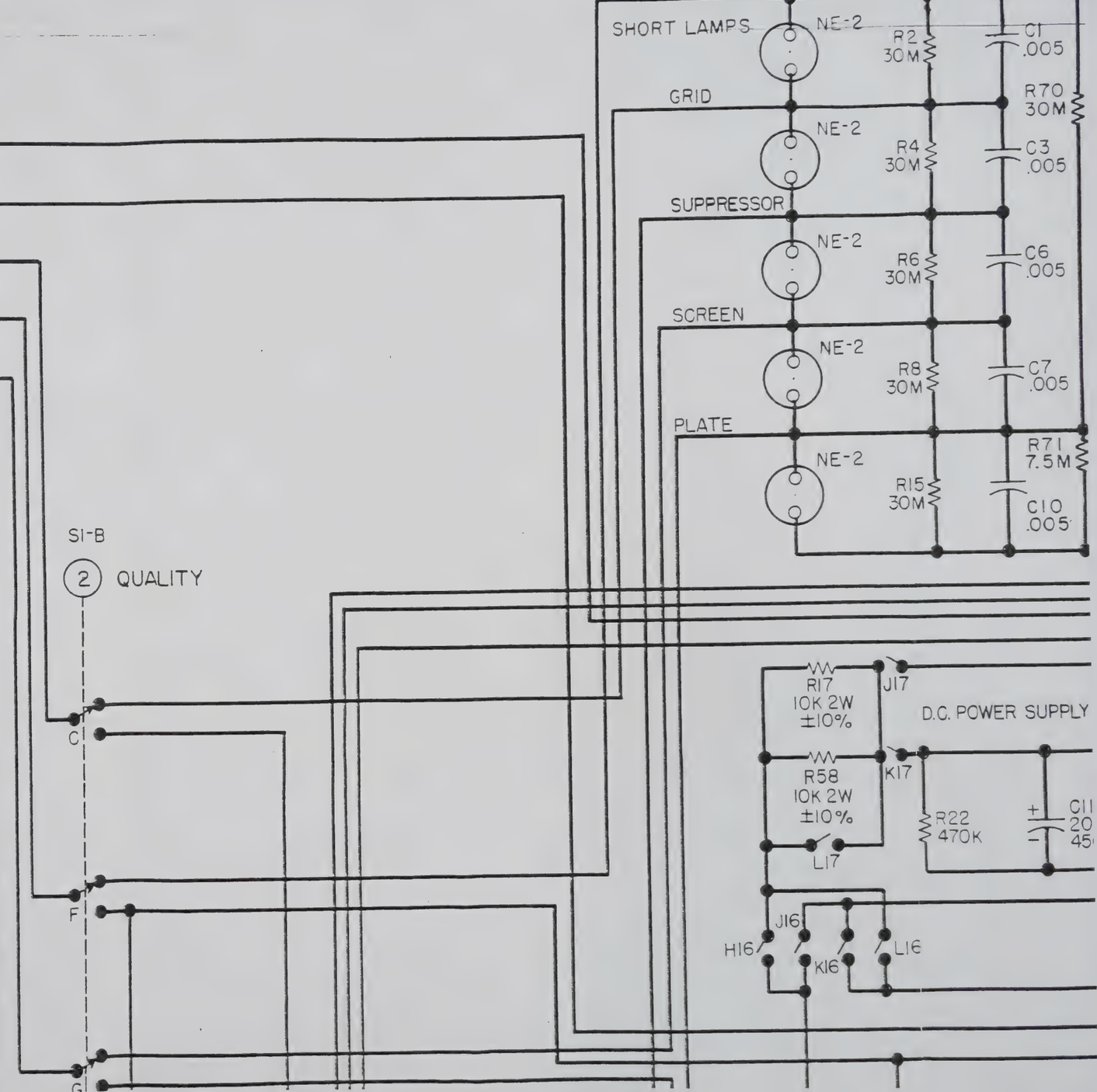
HEATER TO CATHODE LEAKAGE SHUNTS
H17 R47 5.1K
G17 R50 11K
F17 R52 33K

NO.	ALTERATION	BY	APP'D	DATE
C	21417	RB	LAT	11-7-59
B	18805-18905	LD		7-17-58
A	18627-18692	RN		2-20-58



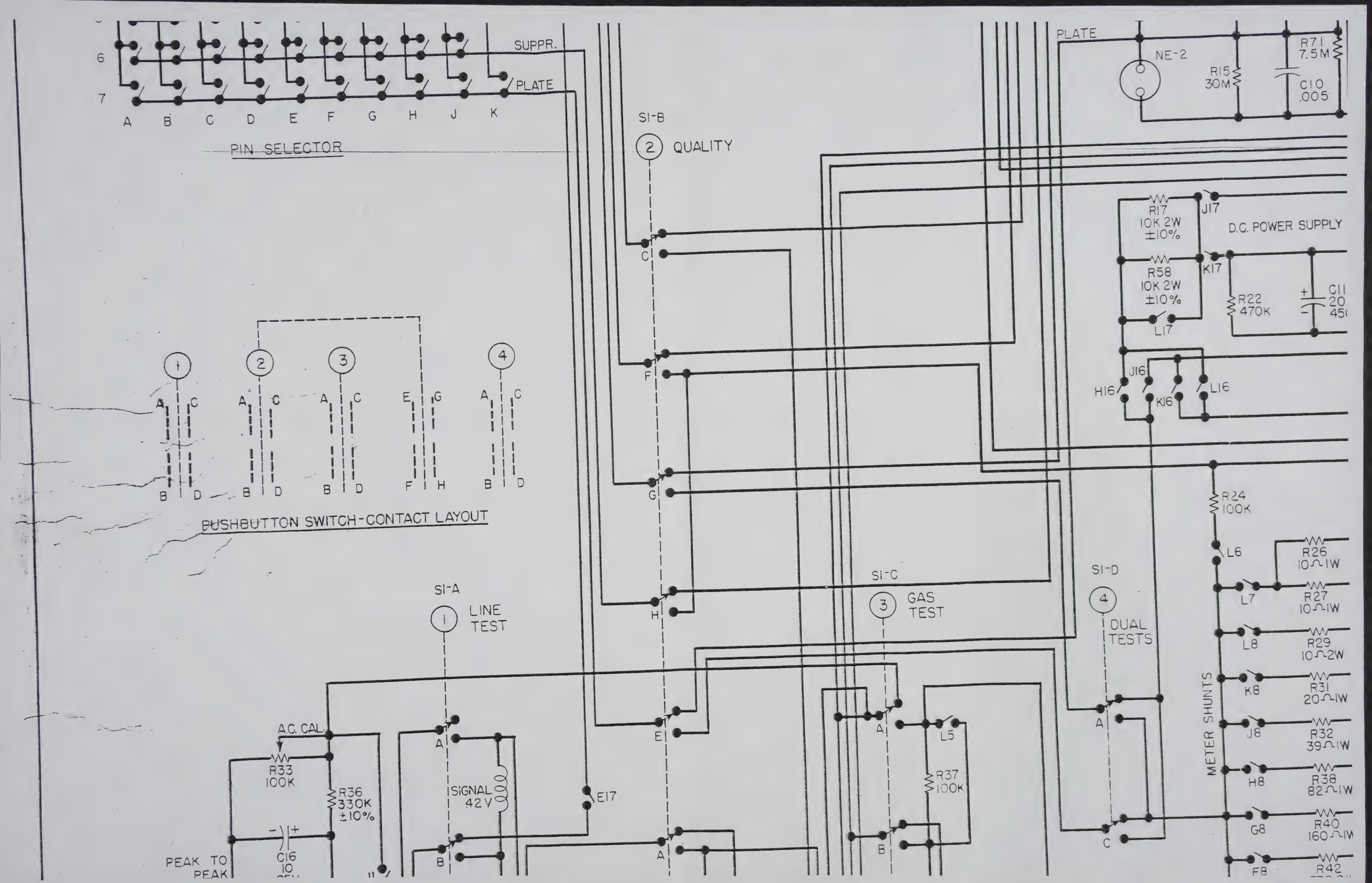
PIN SELECTOR





PIN SELECTOR

PUSHBUTTON SWITCH-CONTACT LAYOUT



HICKOK

Your Guarantee

The Hickok Electrical Instrument Company warrants instruments manufactured by it to be free from defective material or factory workmanship and agrees to repair such instruments which under normal use and service, discloses the defect to be the fault of our manufacturing. Our obligation under this warranty is limited to repairing any instrument or test equipment which proves to be defective, when returned to us, transportation prepaid, within ninety (90) days from the date of original purchase and provided the serial number has been made known to us promptly for our records.

This warranty does not apply to any of our products which have been repaired or altered by unauthorized persons or service stations in any way so as, in our judgment, to injure their stability or reliability or which have been subject to misuse, negligence, or accident, or which have had the serial number altered, effaced, or removed. Neither does this warranty apply to any of our products which have been connected, installed, or adjusted otherwise than in accordance with the instructions furnished by us. Accessories including all vacuum tubes not of our manufacture used in this product are not covered by this warranty.

This warranty is in lieu of all other warranties expressed or implied and no representatives or person is authorized to assume for us any other liability in connection with the sale of our products.

Parts will be made available for a minimum period of five (5) years after the manufacture of this equipment has been discontinued. Parts include all materials, charts, instructions, diagrams, accessories, etc., which have been furnished in the standard model.

Before returning any equipment for service, under warranty or otherwise, the factory must first be contacted giving the nature of the trouble. Instructions will then be given for either correcting the trouble or returning the equipment. This equipment should be forwarded directly to the Hickok factory, The Hickok Electrical Instrument Company, 10514 Dupont Avenue, Cleveland 8, Ohio. In order to speed the return of the instrument to you, it is recommended that on all repairs you deal directly with the factory at this address, or with an authorized service station in your locality.

REGISTRATION CARD

Be Sure to Return Your Warranty Card Immediately.

The above guarantee is contingent upon the attached registration card being returned to the factory immediately upon receipt of the equipment.

©GOES 461

LITHO IN U.S.A.

Your Guarantee

THE HICKOK ELECTRICAL INSTRUMENT CO.

10514 DUPONT AVENUE • CLEVELAND 8, OHIO

The Standard of Quality

IMPORTANT! NEW MODELS ADDED

HICKOK

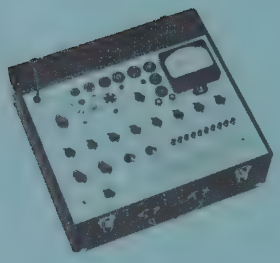
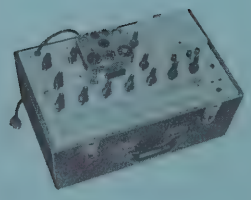
COST SCHEDULE

FEBRUARY 22, 1965

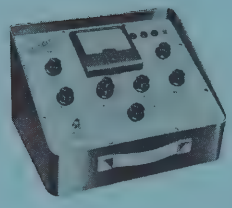
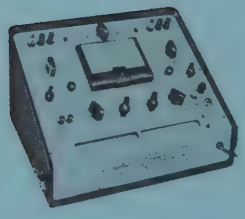
(Supersedes list dated 9-25-64)

MODEL	DESCRIPTION	USER NET PRICE
123R	Industrial and Laboratory Cardmatic Automatic Tube Tester. A genuinely complete tube tester - card-programs complete "fringe" tests, saturation and cut-off tests, in addition to basic Gm measurement. Gm ranges: 500-26,000 umhos. Current ranges: 100 ua to 510MA. Accommodates 4-, 5-, 6-, 7-pin tubes, octals, loctals, 7- and 9-pin miniatures and 7-pin and octal subminiature tubes. Complete with pin straighteners and socket savers. Supplied with 500 selected cards but may be ordered less cards, with user's choice of cards ordered separately. See below. Shipping weight, 57 lbs.	$585.00
123R	Industrial and Laboratory Cardmatic Automatic Tube Tester. Identical to above unit but less cards. Shipping weight, 52 lbs.	545.00
121	Low Cost, High Speed Cardmatic Automatic Tube Tester. A low priced version of the Model 123R brings the advantages of card-programmed testing within reach of the smallest service shop or industrial user. Measures Gm plus saturation, cut-off and important "fringe" tests. Accommodates 4-, 5-, 6-, 7-pin tubes, octals, loctals, 7- and 9-pin miniatures. Also tests transistors and diodes. Supplied with 342 selected cards covering popular entertainment tube types. Shipping weight, 39 lbs.	359.50
121	Low Cost, High Speed Cardmatic Automatic Tube Tester. Identical to above unit but less cards. Shipping weight, 36 lbs.	329.50
100-552	Card Punch with 50 blank cards for Model 121. (Order by Code #100-552.)	20.00
100-547	Card Punch with 50 blank cards for Models 123, 123A, 123R. (Order by Code #100-547.)	20.00

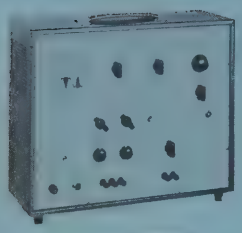
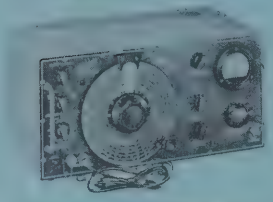
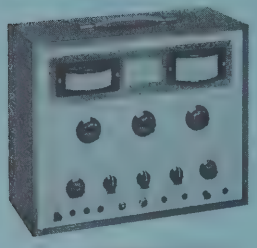
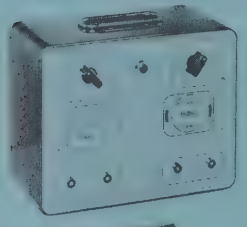
A self-mailing order form listing more than 2,000 additional test cards, is packed with each Cardmatic Tester. This makes it possible for the user to select only the cards he needs and will use. Supplemental lists, covering new test cards available for newly released tubes, are issued periodically to all registered owners of Cardmatic testers and to those who have previously ordered test cards.

	MODEL	DESCRIPTION	USER NET PRICE
	580 Shipped from Cleveland	Laboratory and Industrial Portable Tube Tester. An entirely new instrument which can be set up directly to any tube test condition without having to rely upon the built-in roll chart. All tube test potentials individually variable. Accommodates 4-, 5-, 6-, 7-pin, loctal, octal, 7-, 9- and 10-pin miniature, 7- and 8-pin subminiature, 5- and 7-pin Nuvistors, Compactrons and Novars. Leakage test sensitivity to 50 megohms. Gas test circuit detects grid current to 0.05 microamperes. Gm range to 60,000 umhos. Cathode reserve test. Push button feature speeds checks on dual section tubes. Shipping weight, 35 lbs.	$585.00
	539C	Industrial and Laboratory Portable Tube Tester. Tests all the latest tubes, including Compactrons, Novars, 5- and 7-pin Nuvistors, 10-pin "headers", VR tubes, low power thyratrons, "4-digit" types. VR test evaluates voltage regulator tubes under actual operating conditions. Provision for separate monitoring of plate current. Panel terminals provide access to grid, plate, cathode and heater circuits, permitting direct measurement of voltages and current for "nonstandard" or "tailored" tests. Covers 600 to 60,000 umhos in six ranges. Metered line voltage, metered grid voltage. Dual leakage readings: directly on meter or by neon short indicator (sensitivity to 50 megohms). Complete with socket savers. Shipping weight, 35 lbs.	485.00
		Also available in aluminum case (additional)	37.30
	752A	Industrial and Communications Portable Tube Tester. Designed for use in maintaining communications equipment and industrial electronic apparatus. New voltage regulator test circuit tests VR tubes to handbook specifications, including firing point, regulating voltage and current range. Tests all the latest tubes including Compactrons, Novars, 5- and 7-pin Nuvistors, 10-pin "headers". Push button test feature for dual-section tubes speeds selection of tubes for balanced or matched characteristics. Covers 1500 to 30,000 umhos in five ranges. Interelement leakage read directly on the meter (sensitivity to 10 megohms). Illuminated meter and roll chart. Complete with socket savers and pin straighteners. Shipping weight, 27 lbs.	355.00
	6000A	Service Technician's High Speed Deluxe Portable Tube, Transistor and Diode Tester. Tests all the latest tubes including Compactrons, Novars, 5- and 7-pin Nuvistors, 10-pin "headers". Tests on new types are complete and accurate -- no paralleled elements. Sensitive, neon lamp type instantaneous interelement leakage and shorts test. Covers 3,000 to 15,000 umhos in three ranges. Also tests transistors and diodes. Complete with test leads. Shipping weight, 21 lbs.	239.50
	RSP-4C	Accessory Socket Plate Assembly for Model 6000A only to test older 4-, 5-, 6- and 7-pun tubes as well as octal, loctal, 7-, 9- and 10-pin miniature types. (Order by Code #1050-145.)	27.50
	SA-1	Subminiature Adapter for Model 6000 and 6000A, tests 7-pin inline and 8-pin round. (Order by Code #1050-94.)	8.95

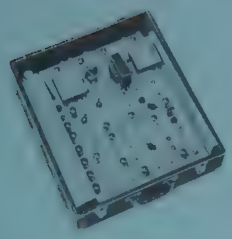
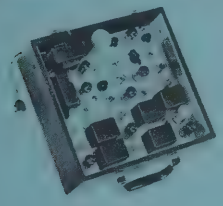
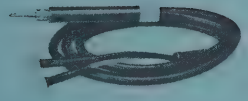
	MODEL	DESCRIPTION	USER NET PRICE
	800A	Service Technician's Portable Tube, Transistor and Diode Tester. NOW tests Compactrons, 10-pin "headers", 5- and 7-pin Nuvistors and Novars, in addition to 4-, 5-, 6-, 7-pin tubes, octals, loctals and 7- and 9-pin miniatures. Provides direct meter reading of interelement leakage and shorts. New filament continuity test speeds test of series string tubes. Also tests transistors and diodes. Complete with test leads. shipping weight, 21 lbs.	$199.95
	SA-2	Subminiature Adapter for Model 800A tests 7-pin inline and 8-pin round. (Order by Code #1050-99.)	8.95
	799	"Mustang" Multi-socket Tube Tester. Mutual Conductance tests in a unique solid-state design. Transistorized sensing circuit provides 50 megohm leakage tests, 0.1 ua gas and emission tests. 39 sockets including new decal 10-pin socket. Color-coded "permutator" switch triples effective socket coverage. Two continuously variable Gm ranges to 20,000 umhos. Replaceable panel plate accommodates socket assembly for future tube additions. Shipping weight, 21 lbs.	199.95
		SOCKET ADAPTERS AND ACCESSORIES	
	CA-4	Universal Adapter for testing Compactrons, Novars, 5- and 7-pin Nuvistors, 10-pin types. No paralleled connections - gives an honest, complete mutual conductance test when used with a Hickok Tube Tester. Suitable for Cardmatic models and most other models except Models 532, 533, 534, 536, 538, 539A, 546, 600 and 605. Shipping weight, 6 lbs.	49.50
	SA-1	Subminiature Adapter, tests 7-pin inline and 8-pin round tubes; for Models 121 and 6000A. (Order by Code #1050-94.)	8.95
	SA-2	Subminiature Adapter, tests 7-pin inline and 8-pin round tubes; for Model 800A. (Order by Code #1050-99.)	8.95
	SA-3	Nuvistor Adapter for all Hickok tube testers, including Models 121 and 123R. (Order by Code #1050-127.)	8.95
	SA-4	Novar Adapter for all Hickok Tube Testers. Used for testing all RCA Novar tubes. (Order by Code #1050-144.)	8.95
	SA-5	Rimlock Adapter for all Hickok Tube Testers. Used for testing European rimlock tubes. (Order by Code #1050-129.)	13.95
	SA-6	Adapter for testing 829B and 832 tubes in any Hickok Tube Tester. (Order by Code #1050-107.)	14.75
	SA-7	Acorn Adapter - for Models 539C, 800 and 6000A. (Order by Code #1050-9.)	16.75
	SR-1 (7-pin), SR-2 (8-pin), SR-3 (9-pin)	Socket Saver Set. Designed specifically for use with older Hickok Tube Testers. Eliminates errors due to parasitic effects. (Order by Code #1050-75.)	12.95

MODEL	DESCRIPTION	USER NET PRICE
	SW-1 (7-pin), SW-2 (8-pin), SW-3 (9-pin) - Socket Saver Set for all late model tube testers. (Order by Code #1050-60).	$ 9.50
CRT-1	Picture Tube Adapter Accessory - Tests all picture tubes, including 110° types. For use with all current Hickok manual tube testers. (Order by Code #1050-114.)	15.75
	Tube Tester Roll Charts. Specify Model and serial number.	1.75
	Tube Tester Roll Chart Subscription (Two years, 4 charts, mailed semi-annually)	5.00
	220/110 volt 50/60 cycle transformer. For 220 volt operation.	29.50
 890	Hickok's new Dynamic Beta IN-CIRCUIT Transistor Tester. Utilizes unique test circuit to measure AC Beta in OR OUT of circuit with 5% accuracy. Measures these in-circuit parameters: AC Beta, Ic. Rin (transistor input impedance), Z Ohms (base-emitter circuit impedance). Measures AC Beta, Ic, Rin and Icbo out of circuit. Portable, completely self-contained, fully transistorized. Complete with test leads. Shipping weight, 8 lbs. Shipped less batteries.	139.50
 870	Dynamic Beta Transistor Tester. Measures AC and DC Beta. Variable collector voltage and current permits tests according to manufacturer's specifications. Tests switching transistors. Measures large signal DC Beta on power transistors - small signal AC Beta on low and medium power transistors. Collector Test current variable up to 2 amperes, permitting Beta measurement on power transistors rated 5 amperes or more. Icbo Ranges: 100 ua, 1 ma, 10 ma. Beta ranges: 0-100, 0-300. Complete with replaceable roll chart. Shipping weight, 22 lbs.	355.00
	Roll Chart for Model 870	1.75
	Roll Chart Subscription (Two years, 4 charts, mailed semi-annually)	5.00
850P	Engineer's Portable Transistor Analyzer. Ideal for use as a "breadboard" in transistor circuit design and development. Checks parameters in any of 3 configurations, common base, common emitter and common collector. Identical input and output meters cover 100 ua to 1 amp in 5 ranges. Furnished in attractive black leatherette portable carrying case. Battery operated. Shipping weight, 20 lbs. Shipped less batteries.	169.50
NEW! 235A Shipped from Cleveland	UHF/VHF Field Strength Meter. Reads directly in absolute field strength in microvolts from channel 2 through 83. Range, 10 to 100,000 microvolts VHF, 30 to 50,000 microvolts UHF. Choice of 75 or 300 ohm input. Headphone jack for audio monitoring. Battery operated and completely portable. Shipped less batteries and headphone. Shipping weight, 10 lbs.	229.50

	MODEL	DESCRIPTION	USER NET PRICE
	209B	True Vacuum Tube Volt-Ohm-Milliampere and Capacitance Meter. 100 millivolt sensitivity. Special "lo-ohms" range. Measures capacitance as low as 1 uuf and up to 1,000 uf; inductance, 50 mh to 100 henries (with conversion chart). 1% stability with $\pm$ 10% variation in line voltage. Complete with AC and DC probe assemblies, test leads, low capacity-high frequency probe. Shipping weight, 26 lbs.	$239.50
	470A	Electronic Volt-Ohmmeter. Lightweight portable with advanced UNI-SCALE design reducing basic scales to TWO. AC-DC values read from the same scales. High sensitivity range (0.5 volt AC-DC) is especially suited for measuring transistor bias and similar potentials in the millivolt range. New AC-DC-Ohms single unit probe eliminates need for multiple leads. Complete with probe and leads. Shipping weight, 10 lbs.	79.50
	PR-50KVA	High voltage probe for use with Model 470A to check voltages up to 30 KV. Shipping weight, 2 lbs.	16.95
	455A	Burnout-proof Volt-Ohm-Milliammeter. Has Hickok's exclusive overload cut-out and protection system providing complete safety against burn-outs for the meter and all multipliers, shunts and other components. 20,000 ohms/volt AC and DC. Attractive, streamlined case, large, easy-to-read meter, complete with leads. Standard pack, two to a carton. Shipping weight, 12 lbs. total. Shipped less batteries.	89.50
	PR-46	High voltage probe for use with Models 455 and 455A to measure up to 6 KV. Shipping weight, 2 lbs. (Order by Code #19670-34).	19.95
	PR-430	High voltage probe for use with Models 455 and 455A to measure 30 KV. Shipping weight, 2 lbs. (Order by Code #19670-33.)	18.90
	457	Portable Volt-Ohm-Milliammeter. Same features as 455A except without burnout-proof protection. 20,000 ohms/volt DC, 1,000 ohms/volt AC. Two to a carton. Shipping weight, 12 lbs. Shipped less batteries.	45.00
		Carrying Case for Models 455A and 457. (Order by Code #3145-388.)	12.50
NEW!	727	FM Stereo Multiplex Generator. Composite audio output includes main channel (L+R) and sub-channel (L-R). Basic audio source is 1000 cycle oscillator switchable to left or right channel. Crystal-controlled 19KC pilot carrier included. RF output at 100MC, adjustable to $\pm$ 200KC. Level fixed at 500 microvolts. Separate 38KC signal available for filter and band-pass alignment. 67KC signal for adjusting SCA trap and filter. Separation of 35db or better. Fully transistorized, choice of portable battery operation or optional AC power supply. Furnished with leads and instruction book. Shipping weight, 7 lbs. Shipped less batteries.	199.95

	MODEL	DESCRIPTION	USER NET PRICE
	725 Shipped from Cleveland	Stereo Standard FM Multiplex Generator. Generates complete composite FM Multiplex signal to FCC specifications. Can be externally modulated with a stereo mike, tape player or record player to demonstrate FM Stereo. Shipping weight, 27 lbs.	$495.00
	295X Shipped from Cleveland	Microvolt and Crystal-controlled Generator. Provides continuous frequency coverage in 8 bands from 125 KC to 175 MC. Calibrated metered output from 0.1 to 100,000 microvolts. 1% Dial calibration accuracy. Built-in 1 MC crystal standard. Precision step attenuator. Direct reading, vernier tuning. Complete with IMC crystal, 48-inch output cable with 2 connectors. Shipping weight, 47 lbs.	655.00
	288AX	Crystal-controlled, High Output AM-FM Sweep and Marker Generator. A complete alignment instrument with built-in decibel meter, crystal-controlled frequency standard, 8 bands from 35KC to 160 MC FM, 110KC to 110 MC AM. New 35-125KC ultrasonic band. Provides for internal or external amplitude or frequency modulation of RF output. Complete with 100 KC/1000 KC crystals, cable assembly and meter leads. Shipping weight, 33 lbs.	315.00
	615	Sweep and Marker Alignment Generator. For complete TV IF and RF Alignment. Also provides harmonic output on UHF. All electronic sweep with no moving parts. Amplitude modulation less than 0.1db/MC. Complete with leads. Shipping weight, 39 lbs.	359.50
	75	Adapter (Converts 90 ohms unbalanced to 300 ohms balanced). Shipping weight, 2 lbs. (Order by Code #1050-44.)	12.95
	691	Heterodyne Marker-adder. Provides a continuously visible marker (including trap points) that will not alter or distort the receiver's response curve. Functions with any associated marker and sweep equipment that has an output capability of 0.05 volts or more. Complete with leads. Shipping weight, 16 lbs.	129.50
	760 Shipped from Cleveland	Video Scanner. Generates and scans at the 525 line, 60 field 30 frame system. Produces slide pictures for closed circuit television systems. Uses high definition, flying spot scanning method, providing 450 line resolution (5MC band width). Choice of video or RF output. Crystal-controlled Sync Generator. Complete with output cable, pattern slides. Shipping weight, 51 lbs.	455.00
NEW!	662 Shipped from Cleveland	Installer's Color TV Generator. Generates ultra-fine dots, crosshatch, vertical bars and horizontal bars. Uses 500-dot system for smallest practical dot and complete screen coverage. Has exclusive crystal-controlled burst phase color bar for checking color circuits, trouble shooting and color alignment. Gun killer facilitates convergence, purity check and chroma alignment. Shipping weight, 15 lbs.	159.95
	CA-62	CRT connector assembly for use with Motorola 23" and RCA 25" color tubes.	9.95

(Quantity discounts apply)

	MODEL	DESCRIPTION	USER NET PRICE
	656XC Shipped from Cleveland	Color Bar, White Dot-Bar TV Generator. Produces 100% fully-saturated NTSC approved standard pattern. Provides complete range of signals for chroma alignment, including I, Q, R-Y, G-Y and -(G-Y) demodulation systems. Shipping weight, 45 lbs.	$549.50
	661	Chrom-Aligner NTSC Color Bar-White Dot Generator. Generates individual 100% saturated color bars to NTSC standards. Provides the following demodulator alignment signals: R-Y, B-Y, -G-Y, G-Y at 90°, RF output on channels 3 or 4. Crystal-controlled chroma and sync. Video output 1.5v p-p across 75 ohms. 110v-60 cycles-20 watts. Complete with leads. Shipping weight, 20 lbs.	349.50
	660	Crystal-controlled White Dot-Bar Color Display Television Generator. All frequencies crystal controlled and locked together, providing stable dots of correct size. Circuitry completely compatible with new design receivers. Lightweight portable for in-the-home servicing. Complete with 2 crystals and instruction book. Shipping weight, 21 lbs.	245.00
	677 Shipped from Cleveland	Wide-Band Service Technician's Oscilloscope - 5" AC - 5 cps to 4.5MC within 3db. New 1-2-3 circuit approach simplifies peak-to-peak measurements. Pre-set horizontal and vertical sweep positions. Has sharp, bright trace with astigmatic correction. Facilitates detailed observation of TV sync wave forms, including 3.58MC color burst. Furnished complete with detailed application and instruction book and test leads. Shipping weight, 36 lbs.	199.50
	35	Demodulation Probe for signal tracing with Models 677 and 675A. Has amphenol type connector. (Order by Code #3030-96.)	7.75
	34	Demodulation Probe for older Hickok oscilloscopes. Has spade lug connector. (Order by Code #3030-34.) Shipping weight, 2 lbs.	9.95
	TVP-67	Low capacity probe for Model 677. Increases scope impedance to 33 megohms shunted by 9 mmfd. Specify amphenol or spade lug connector.	10.95
	675A	Wide-band, high sensitivity 5" DC Oscilloscope. Unique vertical amplifier design shortens rise time by eliminating peaking coils, providing smooth response from 0 (DC) to 4.5MC (within 3db). Assures undistorted reproduction of 3.58MC color TV signals. Astigmatism corrected, 1700v deflection potential provides sharp, bright trace detail. Complete with low-capacity probe, ground lead and instruction book. Shipping weight, 45 lbs.	299.90
NEW!	770A	5", Wide-band Industrial and General Purpose Oscilloscope. Calibrated 4MC DC vertical amplifier with 8-step and vernier attenuator. Built-in square wave calibrator. Eighteen direct reading, calibrated sweep rates from 0.5 sec/div to 1 usec/div. Choice of free-running, driven or automatic sweep modes. 5 times sweep magnifier. Flat-faced, post-accelerated CRT. Illuminated, calibrated graticule. Shipping weight, 57 lbs.	585.00

MODEL	DESCRIPTION	USER NET PRICE
TVP-1	General Purpose low-capacity probe. Has spadé lug type connectors. Shipping weight, 2 lbs. (Order by Code #16970-35).	$ 18.75
	CRYSTALS	
Shipped from Cleveland	Sound Channel Crystals for 610A and 690. (Specify Channel)	17.50
	1.0 MC Crystal for 295X	8.75
	2.5 MC Crystal for 690	7.95
	4.5 MC Crystal for 610A, 680 and 690	7.95
	Special frequencies for 610A, 690, 290X, 295X , are accepted on a non-cancellation basis. Allow 30 days minimum delivery.	Prices on request

MINIMUM BILLING TO ESTABLISHED ACCOUNTS: $3.50

TERMS: Net 30.

ALL PRICES F. O. B. SHIPPING POINT

All items in this price schedule shipped from Greenwood, Mississippi, unless indicated as "Shipped from Cleveland."

ALL PRICES AND SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

HICKOK

The Hickok Electrical Instrument Co.

10514 Dupont Avenue Cleveland, Ohio 44108

Litho in U.S.A.

CARDMATIC CARD ORDER FORM

THE HICKOK ELECTRICAL INSTRUMENT CO.
10514 DUPONT AVENUE
CLEVELAND, OHIO 44108

MODELS 123A - 123R - 1230

TO SIMPLIFY ORDERING, FOLLOW THE STEP-BY-STEP SEQUENCE ❶ THROUGH ❼, BELOW.

❶ **SHIP TO:**
(Type or Print)

Name

Firm

Address

City | State | Zip Code

DO NOT USE THIS SPACE

❷ **BILL TO:**

Name

Firm

Address

City | State | Zip Code

❸ **HOW SHALL WE SHIP?**

☐ Parcel Post ☐ Air Parcel Post ☐ Other (Specify) _____

❹ **HOW TO ORDER**

All tube test cards currently available are listed on the following pages. In the column headed "No. of CARDS", circle the number opposite "Tube Type" desired. (Note that many tubes require multiple cards for complete testing.)
Total the number of cards ordered on each page.
Add all column totals and enter grand total here → ☐ cards

❺ **PRICES**

1000 cards or more	10c each
500 to 999	11c each
200 to 499	13c each
100 to 199	15c each
50 to 99	17c each
1 to 49	28c each

= $_____ Amount of order

(NOTE: You will save in quantities over 49. For example, 30 cards cost $8.40. Fifty cards cost $8.50 — only 10c more.)

❻ **MANNER OF PAYMENT**

CASH ENCLOSED	☐ Ship C.O.D.	☐ Bill Us (Established Accounts Only— Minimum Billing $3.00)	PURCHASE ORDER NO.
$			

Fold order form so address on last page shows, staple, add proper postage and drop in mail.

HICKOK'S FREE CARDMATIC CARD SUBSCRIPTION SERVICE

If you have just purchased your CARDMATIC® be sure to fill out and return the warranty registration card. This places you on our mailing lists to receive free, regular and up-to-date card ordering information covering new tube releases. If your CARDMATIC® has not been registered with us you can receive this free service by checking block ❼ below.

❼ ☐ Please place my name on your free CARDMATIC® card subscription list.

Models 123A - 123R - 1230
Code No. 3200-82

Printed in U.S.A.

EUROPEAN TUBE TEST CARDS

European tube test cards are included in this collation list and those tubes that have Electronic Industries Association registrations are listed with respect to the American EIA Number: EL84/6BQ5 is listed with respect to 6BQ5. Consult the following cross index for desired European tube test cards. Additional European tubes follow tube type 38142.

European Tube	American Number	European Tube	American Number	European Tube	American Number	European Tube	American Number
D3A	7721	EC92	6AB4	EL81	6CJ6	PL81	21A6
DF96	1AJ4	EC93	6AF4	EL83	6CK6	PL82	16A5
DK96	1AB6	EC95	6ER5	EL84	6BQ5	PL83	15A6
DL67	6007	EC97	6FY5	EL85	6BN5	PL84	15CW5
DL96	3C4	EC900	6HA5	EL86	6CW5	PLL80	12HU8
DM70	1M3	ECC84	6CW7	EL91	6AM5	PY80	19X3
DM71	1N3	ECC85	6AQ8	EL95	6DL5	PY81	17Z3
DM160	6977	ECC86	6GM8	ELL80	6HU8	PY82	19Y3
DY87	1S2A	ECC88	6DJ8	EM34	6CD7	UABC80	28AK8
E80CC	6085	ECC91	6J6	EM80	6BR5	UCC85	26AQ8
E80CF	7643	ECC186	7316	EM81	6DA5	UCH81	19D8
E80F	6084	ECC189	6ES8	EM84	6FG6	UCL82	50BM8
E80L	6227	ECF80	6BL8	EM87	6HU6	UF41	12AC5
E81L	6686	ECF82	6U8	EQ80	6BE7	UY41	31A3
E83F	6689	ECF86	6HG8	EY80	6U3	UY85	38A3
E88CC	6922	ECF801	6GJ7	EY81	6R3	XC97	2FY5
E90CC	5920	ECH42	6CU7	EY82	6N3	XC900	2HA5
E90F	7693	ECH81	6AJ8	EY84	6374	XCC189	4ES8
E91H	6687	ECH83	6DS8	EY86	6S2	XCF80	4BL8
E99F	7694	ECH84	6JX8	EY88	6AL3	XCH81	3AJ8
E130L	7534	ECL80	6AB8	EZ40	6BT4	XCL82	8B8
E180CC	7062	ECL82	6BM8	EZ80	6V4	XCL85	9GV8
E180F	6688	ECL84	6DX8	EZ81	6CA4	XF80	3BX6
E182CC	7119	ECL85	6GV8	GZ34	5AR4	XF183	3EH7
E186F	7737	ECL86	6GW8	HCC85	17EW8	XF184	3EJ7
E188CC	7308	EF41	6CJ5	HCH81	12AJ7	XL36	13CM5
E280F	7722	EF80	6BX6	HL94	30A5	XL84	8BQ5
E810F	7788	EF85	6BY7	LC900	3HA5	XL86	8CW5
EABC80	6AK8	EF86	6267	N78	6BJ5	XY88	16AQ3
EAF42	6CT7	EF89	6DA6	PC97	4FY5	YC97	3FY5
EBC41	6CV7	EF91	6AM6	PC900	4HA5	YCC189	5ES8
EBC81	6BD7A	EF92	6065	PCC85	9AQ8	YF183	4EH7
EBF80	6N8	EF97	6ES6	PCC88	7DJ8	YF184	4EJ7
EBF83	6DR8	EF98	6ET6	PCC189	7ES8	6R-K19	6BR3
EBF89	6DC8	EF183	6EH7	PCF80	9A8	12R-K19	12BR3
EC80	6Q4	EF184	6EJ7	PCF86	7HG8	17R-K19	17BR3
EC81	6R4	EL34	6CA7	PCF801	8GJ7	25R-K19	25BR3
EC86	6CM4	EL36	6CM5	PCL82	16A8	85A1	OE3
EC88	6DL4	EL38	6CN6	PCL84	15DQ8	85A2	OG3
EC91	6AQ4	EL41	6CK5	PL36	25E5	150B2	6354
						6061	6BW6
						6132	6CH6

HICKOK MODEL 123A-123R-1230 CARDMATIC TUBE TESTER

CUSTOM CARD COLLATION LIST

DO NOT USE	TUBE TYPE	No. of CARDS
	01A	1
	0A2	4
	0A3	4
	0A4	2
	0B2	4
	0B3	4
	0C2	4
	0C3	4
	0D3	4
	0E3 (85A1)	3
	0G3 (85A2)	3
	0Z4	1
	0Z4A (1003)	1
	1A3	2
	1A4	1
	1A5	1
	1A7	2
	1AB5	1
	1AB6 (DK96)	2
	1AD4	1
	1AD5	1
	1AE4	2
	1AF4	1
	1AG4	1
	1AG5	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	1AH4	1
	1AH5	2
	1AJ4 (DF96)	1
	1AJ5	2
	1AK4	1
■	1AU2	1
	1AU3	1
	1AX2	1
	1B3	1
	1B4	1
	1C5	1
	1C21	2
	1D8	3
	1DN5	2
	1G3	1
	1G4	1
	1G6	2
	1H2	1
	1H4	1
	1H5	2
	1J3	1
	1K3	1
	1L4	1
	1L6	2
	1LA4	1
	1LA6	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	1LB4	1
	1LC5	1
	1LC6	2
	1LD5	2
	1LE3	1
	1LF3	1
	1LG5	1
	1LH4	2
	1LN5	1
	1M3 (DM70)	2
	1N2	1
	1N3 (DM71)	2
	1N5	1
	1P5	1
	1Q5	1
	1R4 (1294)	1
	1R5	2
	1S2A (DY87)	1
	1S4	1
	1S5	2
	1T4	1
	1T5	1
	1U4	1
	1U5	2
	1U6	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	1V	1
	1V2	1
	1V5	1
	1V6	2
	1W5	1
	1X2	1
	1Z2	1
	2A3	1
	2A4	3
	2A5	1
	2A6	3
	2A7	2
	2AC15	1
	2AF4	1
	2AS15	1
■	2AV2	1
	2B3	1
	2B4	3
	2B7	3
	2B22	1
	2BN4	1
	2C4	3
	2C22	2
	2C26A	3
	2C34	2
	2C40	2
	2C42	2
Total This Column		

■ Addition

DO NOT USE	TUBE TYPE	No. of CARDS
	2C43	2
	2C46	2
	2C50	6
	2C51	2
	2C52	4
	2C53	2
	2CW4	1
	Adapter Req'd Code: 1050-127	
	2CY5	1
	2D21	3
	2DS4	1
	Adapter Req'd Code: 1050-127	
■	2DX4	1
	2DZ4	1
	2E5	2
	2E22	2
	2E24	3
	2E25	1
	2E26	3
	2E30	1
	2E31	1
	2E32	1
	2E35	1
	2E36	1
	2E41	2
	2E42	2
	2EA5	1
	2EN5	2
	2ER5	2
	2ES5	2
	2EV5	1
	2FH5	1
	2FQ5	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	2FS5	1
	2FY5 (XC97)	2
	2G21	2
	2GK5	1
■	2GU5	1
	2GW5	1
	2HA5 (XC900)	1
■	2HK5	1
	2T4	1
	2V2	1
	2V3	1
	2X2A	1
	3A2	1
	3A3	1
	3A4	2
	3A5	2
	3AF4	1
	3AJ8 (XCH81)	2
	3AL5	2
	3AU6	1
	3AV6	3
	3AW3	1
	3B2	1
	3B4	2
	3B7	2
	3B24	2
	3BA6	1
	3BC5	1
	3BE6	2
	3BN4	1
	3BN6	2
	3BU8	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	3BX6 (XF80)	2
	3BY6	2
	3BZ6	1
	3C2	1
	3C4 (DL96)	1
■	3CA3	1
	3CB6	1
	3CE5	1
	3CF6	1
	3CS6	2
	3CY5	1
	3D6 (1299)	1
	3D21A	2
	3DG4	1
	3DK6	1
	3DT6	2
■	3DX4	1
	3DZ4	1
	3E6	1
	3E29	2
	Adapter Req'd Code: 1050-107	
	3EA5	1
	3EH7 (XF183)	2
	3EJ7 (XF184)	2
	3ER5	2
	3ES5	2
	3EV5	1
	3FH5	1
	3FQ5	1
	3FS5	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	3FY5 (YC97)	2
	3GK5	1
	3GS8	2
■	3GU5	1
	3GW5	1
	3HA5 (LC900)	1
■	3HK5	1
	3HM6	1
	3HT6	1
■	3JC6	1
	3JD6	1
	3KF8	2
	3LF4	1
	3Q4	1
	3Q5	1
	3S4	1
	3V4	1
	4AU6	1
	4AV6	3
	4BA6	1
	4BC5	1
	4BC8	2
	4BE6	2
	4BL8 (XCF80)	2
	4BN6	2
	4BQ7A	2
	4BS8	2
	4BU8	2
	4BX8	2
	4BZ6	1
	4BZ7	2
	4BZ8	2
Total This Column		

■ Addition

DO NOT USE	TUBE TYPE	No. of CARDS
	4CB6	1
	4CE5	1
	4CS6	2
	4CY5	1
	4DE6	1
	4DK6	1
	4DT6	2
	4EH7 (YF183)	2
	4EJ7 (YF184)	2
	4ES8 (XCC189)	2
	4EW6	1
■	4FY5 (PC97)	1
	4GK5	1
■	4GM6	1
	4GS8	2
	4GW5	1
	4GZ5	1
	4HA5 (PC900)	1
■	4HK5	1
	4HM6	1
	4HS8	2
	4HT6	1
■	4JC6	1
	4JD6	1
■	4JK6	1
	4KF8	2
■	4M-P12	1
■	4M-P26	1
	5A6	2
	5AM8	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	5AN8	2
	5AQ5	1
	5AR4 (GZ34)	1
	5AS4	1
	5AS8	2
	5AT8	2
	5AU4	1
	5AV8	2
	5AW4	1
	5AZ4	1
	5B8	2
	5BC3 Adapter Req'd Code: 1050-144	1
	5BE8	2
	5BK7A	2
	5BQ7A	2
	5BR8	2
	5BS8	2
	5BT8	3
	5BW8	3
	5BZ7	2
	5CG8	2
	5CL8	2
	5CM6	1
	5CM8	2
	5CQ8	2
	5CZ5	1
	5DH8	2
	5DJ4	2
	5EA8	2
	5EH8	2
	5ES8 (YCC189)	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	5EU8	2
	5EW6	1
	5FG7	2
	5FV8	2
	5GH8	2
	5GM6	1
	5GX6	1
	5HG8	2
	5J6	2
■	5JK6	1
■	5KD8	2
	5KE8	2
■	5M-HH3	2
	5R4	1
	5T4	1
	5T8	4
	5U4	1
	5U8	2
	5V3	1
	5V4	2
	5V6	1
	5W4	1
	5X4	1
	5X8	2
	5Y3	1
	5Y4	1
	5Z3	1
	5Z4	1
	6A3	1
	6A4	1
	6A6	2
	6A7	2
	6A8	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6AB4 (EC92)	1
	6AB5	2
	6AB7	1
	6AB8 (ECL80)	2
	6AC5	1
	6AC7	1
	6AD4	1
	6AD7	2
	6AF3	1
	6AF4 (EC93)	1
	6AF6	2
	6AG5	1
	6AG7	1
	6AH4	1
	6AH6	1
	6AH7	2
	6AJ4	1
	6AJ5	2
	6AJ8 (ECH81)	2
	6AK5	1
	6AK6	1
	6AK8 (EABC80)	4
	6AL3 (EY88)	1
	6AL5	2
	6AL7	2
	6AM4	1
	6AM5 (EL91)	1
■	6AM6 (EF91)	1
	6AM8	2
Total This Column		

■ Addition

DO NOT USE	TUBE TYPE	No. of CARDS
	6AN4	1
	6AN5	1
	6AN6	4
	6AN8	2
	6AQ4 (EC91)	2
	6AQ5	1
	6AQ6	3
	6AQ7	3
	6AQ8 (ECC85)	2
	6AR5	1
	6AR6	1
	6AR8	3
	6AS5	1
	6AS6	2
	6AS7	2
	6AS8	2
	6AT6	3
	6AT8	2
	6AU4	1
	6AU5	2
	6AU6	1
	6AU7	2
	6AU8	2
	6AV5	2
	6AV6	3
	6AW8A	2
	6AX4	1
	6AX5	1
	6AX7	2
	6AX8	2
	6AY3 1 Adapter Req'd Code: 1050-144	
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6AZ8	2
	6B4	1
	6B6	3
	6B7	3
	6B8	3
	6BA3 1 Adapter Req'd Code: 1050-144	
	6BA5	1
	6BA6	1
	6BA7	2
	6BA8	2
	6BC4	1
	6BC5	1
	6BC7	3
	6BC8	2
	6BD4	1
	6BD5	2
	6BD6	1
	6BD7A (EBC81)	3
	6BE6	2
	6BE7 (EQ80)	2
	6BE8	2
	6BF5	1
	6BF6	3
	6BF7W	2
	6BF8	6
	6BG6	2
	6BG7	2
	6BH3 1 Adapter Req'd Code: 1050-144	
	6BH6	1
	6BH8	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6BJ5 (N78)	1
	6BJ6	1
	6BJ7	3
	6BJ8	3
	6BK4	1
	6BK5	1
	6BK6	3
	6BK7A	2
	6BL4	1
	6BL7	2
	6BL8 (ECF80)	2
	6BM8 (ECL82)	2
	6BN4	1
	6BN5 (EL85)	1
	6BN6	2
	6BN8	3
	6BQ5 (EL84)	1
	6BQ6	2
	6BQ7A	2
■	6BR3 (6R-K19)	1
	6BR5 (EM80)	2
	6BR7	1
	6BR8	2
	6BS3 1 Adapter Req'd Code: 1050-144	
	6BS7	1
	6BS8	2
	6BT4 (EZ40) 1 Adapter Req'd Code: 1050-129	
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6BT6	3
	6BT8	3
	6BU8	2
	6BV8	3
	6BW4	1
	6BW6 (6061)	1
	6BW8	3
	6BX6 (EF80)	2
	6BX7	4
	6BX8	2
	6BY5	2
	6BY6	2
	6BY7 (EF85)	1
	6BY8	2
	6BZ6	1
	6BZ7	2
	6BZ8	2
	6C4	1
	6C5	1
	6C6	1
	6C8	2
	6CA4 (EZ81)	1
	6CA5	1
	6CA7 (EL34)	1
	6CB5	2
	6CB6	1
	6CD6	2
	6CD7 (EM34)	3
	6CE5	1
	6CF6	1
Total This Column		

■ Addition

DO NOT USE	TUBE TYPE	No. of CARDS
	6CG7	2
	6CG8	2
	6CH6 (6132)	1
	6CH7	2
	6CH8	2
	6CJ5 (EF41) Adapter Req'd Code: 1050-129	1
	6CJ6 (EL81)	2
	6CK4	2
	6CK5 (EL41) Adapter Req'd Code: 1050-129	1
	6CK6 (EL83)	1
	6CL5	2
	6CL6	1
	6CL8	2
	6CM4 (EC86)	1
	6CM5 (EL36)	2
	6CM6	1
	6CM7	2
	6CM8	2
	6CN6 (EL38)	1
	6CN7	3
	6CQ4	1
■	6CQ6	1
	6CQ8	2
	6CR6	2
	6CR8	2
	6CS6	2
	6CS7	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6CT7 (EAF42) Adapter Req'd Code: 1050-129	2
	6CU5	1
	6CU6	2
	6CU7 (ECH42) Adapter Req'd Code: 1050-129	2
	6CU8	2
	6CV7 (EBC41) Adapter Req'd Code: 1050-129	3
	6CW4 Adapter Req'd Code: 1050-127	1
	6CW5 (EL86)	1
	6CW7 (ECC84)	2
	6CX8	2
	6CY5	1
	6CY7	3
	6CZ5	1
	6D4	3
	6D6	1
	6DA4	1
	6DA5 (EM81)	2
	6DA6 (EF89)	1
	6DA7	3
	6DB5	2
	6DB6	2
	6DC6	1
	6DC8 (EBF89)	3
	6DE4	1
	6DE6	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6DE7	3
	6DG6	1
	6DJ8 (ECC88)	2
	6DK6	1
	6DL4 (EC88)	1
	6DL5 (EL95)	1
	6DM4	1
	6DN6	2
	6DN7	2
	6DQ4	1
	6DQ5	2
	6DQ6	2
	6DR7	3
	6DR4	1
	6DR8 (EBF83)	3
	6DS4 Adapter Req'd Code: 1050-127	1
	6DS5	1
	6DS8 (ECH83)	2
	6DT4	1
	6DT5	2
	6DT6	2
	6DT8	2
	6DW4 Adapter Req'd Code: 1050-144	1
	6DW5	2
■	6DX4	1
	6DX8 (ECL84)	2
	6DZ4	1
	6DZ7	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6DZ8	2
	6E5	2
	6E6	2
	6E7	1
	6EA5	1
	6EA7	3
	6EA8	2
	6EB5	2
	6EB8	2
	6EH5	1
	6EH7 (EF183)	2
	6EH8	2
	6EJ7 (EF184)	2
	6EM5	2
	6EM7	3
	6EQ7	2
	6ER5 (EC95)	2
	6ES5	2
	6ES6 (EF97)	1
	6ES8 (ECC189)	2
	6ET6 (EF98)	1
	6ET7	4
	6EU7	2
	6EU8	2
	6EV5	1
	6EV7	6
	6EW6	1
	6EW7	2
	6EX6	2
	6EY6	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6EZ5	2
	6EZ8	3
	6F4 Adapter Req'd Code: 1050-9	2
	6F5	1
	6F6	1
	6F7	2
	6F8	2
	6F33	1
	6FA7	3
	6FD6	1
	6FD7	2
	6FE5	1
	6FG5	1
	6FG6 (EM84)	2
	6FG7	2
	6FH5	1
	6FH6	2
	6FH8	4
	6FM8	3
	6FQ5	1
	6FQ7	2
	6FS5	1
	6FV6	1
	6FV8	2
	6FW5	2
	6FW8	2
	6FY5 (EC97)	2
	6FY8	2
	6G5	2
	6G6	1
	6GC5	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6GC6	2
	6GD7	2
	6GE8	4
	6GF7 Adapter Req'd Code: 1050-144	2
	6GH8	2
	6GJ5 Adapter Req'd Code: 1050-144	2
	6GJ7 (ECF801)	2
	6GJ8	2
	6GK5	1
	6GK6	1
	6GL7	2
	6GM5	1
	6GM6	1
	6GM8 (ECC86)	2
	6GN8	3
■	6GQ7	3
	6GS8	2
	6GT5 Adapter Req'd Code: 1050-144	2
	6GU5	1
	6GU7	2
	6GV8 (ECL85)	3
	6GW5	1
	6GW6	2
	6GW8 (ECL86)	2
	6GX6	1
	6GY6	1
	6GY8	3
■	6GZ5	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6H6	2
	6HA5 (EC900)	1
■	6HA6	1
	6HB6	2
■	6HB7	2
	6HC8	3
	6HF8	2
■	6HG5	1
	6HG8 (ECF86)	2
	6HJ8	2
■	6HK5	1
	6HL8	2
	6HM6	1
	6HR6	1
	6HS6	1
	6HS8	2
	6HT6	1
	6HU6 (EM87)	2
	6HU8 (ELL80)	2
	6HW8	3
	6HZ6	1
	6HZ8	3
	6J4	3
	6J5	1
	6J6 (ECC91)	2
	6J7	1
	6J8	2
	6JA8	2
	6JB6 Adapter Req'd Code: 1050-144	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6JB8	2
■	6JC6	1
	6JC8	2
	6JD6	1
■	6JE6 Adapter Req'd Code: 1050-144	2
	6JE8	2
	6JF8	3
■	6JG6 Adapter Req'd Code: 1050-144	2
	6JH6	1
	6JH8	3
■	6JK6	1
	6JK8	2
■	6JL6	1
■	6JL8	2
■	6JN8	2
■	6JT6 Adapter Req'd Code: 1050-144	2
	6JT8	2
	6JU8	4
	6JV8	2
	6JX8 (ECH84)	2
■	6JY8	2
	6K5	1
	6K6	1
	6K7	1
	6K8	2
	6KA8	2
	6KD8	2
	6KE8	2
	6KF8	2
	6KL8	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6KM8	4
	6KS8	2
	6KT8	2
■	6KU8	3
■	6KV8	2
■	6KY8 Adapter Req'd Code: 1050-144	3
	6KZ8	2
	6L5	1
	6L6	1
	6L7	2
■	6LB8	2
■	6LF8	2
■	6LM8	2
	6M3	1
■	6N3 (EY82)	1
	6N4	2
	6N5	2
	6N7	2
	6N8 (EBF80)	3
	6P5	1
■	6Q4 (EC80)	1
	6Q5	3
	6Q7	3
	6R3 (EY81)	1
	6R4 (EC81)	1
	6R7	3
	6R8	4
■	6R-P22	1
	6S2 (EY86)	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6S4	1
	6S7	1
	6S8	4
	6SA7	2
	6SB7	2
	6SC7	2
	6SD7	1
	6SF5	1
	6SF7	2
	6SG7	1
	6SH7	1
	6SJ7	1
	6SK7	1
	6SL7	2
	6SN7	2
	6SQ7	3
	6SR7	3
	6SS7	1
	6ST7	3
	6SU7	4
	6SV7	2
	6SZ7	3
	6T4	1
	6T7	3
	6T8	4
■	6U3 (EY80)	1
	6U5	2
	6U6	1
	6U7	1
■	6U8 (ECF82)	2
	6V3	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6V4 (EZ80)	1
	6V6	1
	6V7	3
	6V8	4
	6W4	1
	6W6	1
	6W7	1
	6X4	1
	6X5	1
	6X6	2
	6X8	2
	6Y6	1
	6Y7	2
	6Z4	1
	6Z5 (12Z5)	1
	6ZY5	1
	7A4	1
	7A5	1
	7A6	2
	7A7	1
	7A8	2
	7AD7	1
	7AF7	2
	7AG7	1
	7AH7	1
	7AK7	3
	7AU7	2
	7B4	1
	7B5	1
	7B6	3
	7B7	1
	7B8	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	7C4 (1203A)	1
	7C5	1
	7C6	3
	7C7	1
	7DJ8 (PCC88)	2
	7E5 (1201)	2
	7E6	3
	7E7	3
	7ES8 (PCC189)	2
	7EY6	2
	7F7	2
	7F8	2
	7G7 (1232)	1
	7G8	2
	7H7	1
	7HG8 (PCF86)	2
	7J7	2
	7K7	3
	7L7	1
	7N7	2
	7Q7	2
	7R7	3
	7S7	2
	7T7	1
	7V7	1
	7W7	1
	7X6	2
	7X7	3
	7Y4	1
	7Z4	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	8AU8	2
	8AW8A	2
	8B8 (XCL82)	2
	8BA8A	2
	8BH8	2
	8BN8	3
	8BQ5 (XL84)	1
	8CG7	2
	8CM7	2
	8CN7	3
	8CS7	2
■	8CW5 (XL86)	1
	8CX8	2
	8CY7	3
	8EB8	2
	8EM5	2
	8ET7	4
	8FQ7	2
	8GN8	3
■	8GJ7 (PCF801)	2
	8JK8	2
	8JT8	2
	8JV8	2
	8KA8	2
	8KS8	2
	8SN7	2
	9A8 (PCF80)	2
	9AQ8 (PCC85)	2
	9AU7	2
	9BR7	3
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	9CL8	2
	9DZ8	2
■	9EA8	2
	9GV8 (XCL85)	3
■	9KZ8	2
	9U8	2
	9X8	2
	10BQ5	1
	10C8	3
	10DA7	3
	10DE7	3
	10DR7	3
■	10DX8	2
	10EG7	3
	10EM7	3
	10EW7	2
■	10FD7	2
	10GF7 2 Adapter Req'd Code: 1050-144	
■	10GN8	3
	10HF8	2
	10JA8	2
	10JT8	2
	10JY8	2
■	10KU8	3
■	10LB8	2
	11C5	1
	11CY7	3
	11JE8	2
■	11KV8	2
	12A4	1
	12A6	1
	12A7	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	12A8	2
	12AB5	1
	12AC5 1 (UF41) Adapter Req'd Code: 1050-129	
	12AC6	1
	12AD6	1
	12AD7	2
	12AE6	3
	12AE7	2
	12AF3	1
	12AF6	1
	12AG6	1
	12AH7	2
	12AJ6	4
	12AJ7 (HCH81)	2
	12AL5	2
	12AL8	2
	12AQ5	1
	12AS5	1
	12AT6	3
	12AT7	2
	12AU6	1
	12AU7	2
	12AU8	2
	12AV5	2
	12AV6	3
	12AV7	2
	12AW6	1
	12AX4	1
	12AX7	2
	12AY3 1 Adapter Req'd Code: 1050-144	
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	12AY7	2
	12AZ7	2
	12B4A	1
	12BA6	1
	12BA7	2
	12BD6	1
	12BE6	2
	12BF6	3
	12BH7A	2
	12BK5	1
	12BK6	3
	12BL6	1
	12BN6	2
	12BQ6	2
■	12BR3 1 (12R-K19)	
	12BR7	3
	12BS3 1 Adapter Req'd Code: 1050-144	
	12BT6	3
	12BV7	1
	12BW4	1
	12BX6	2
	12BY7A	1
	12BZ6	1
	12BZ7	2
	12C5	1
	12C8	3
	12CA5	1
	12CM6	1
	12CN5	1
	12CR6	2
	12CS6	2
	12CT8	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	12CU5	1
	12CU6	2
	12CX6	1
	12D4	1
	12DB5	2
	12DE8	2
	12DF5	2
	12DF7	2
	12DJ8	2
	12DK6	1
	12DK7	3
	12DL8	3
	12DM4	1
	12DM5	2
	12DQ4	1
	12DQ6	2
	12DQ7	2
	12DS7	3
	12DT5	2
	12DT7	2
	12DT8	2
	12DU7	3
	12DV7	3
	12DV8	3
	12DW5	2
	12DW7	2
	12DW8	3
	12DY8	2
	12DZ6	1
	12DZ8	2
	12EA6	1
	12EC8	3
	12ED5	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	12EG6	2
	12EH5	1
	12EK6	1
	12EL6	3
	12EM6	2
	12EN6	2
	12EQ7	2
	12EZ6	1
	12F5	1
	12F8	3
	12FK6	3
	12FM6	3
	12FQ8	4
	12FR8	3
	12FT6	3
	12FV7	4
	12FX5	1
	12FX8	2
	12G8	1
	12GA6	1
■	12GB3	2
	12GC6	2
	12GJ5	2
	Adapter Req'd Code: 1050-144	
	12GN7	1
	12GT5	2
	Adapter Req'd Code: 1050-144	
	12GW6	2
	12H6	2
	12HU8 (PLL 80)	2
	12J5	1
	12J7	1
	12J8	3
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
■	12JB6	2
	Adapter Req'd Code: 1050-144	
■	12JN8	2
■	12JT6	2
	Adapter Req'd Code: 1050-144	
	12K5	1
	12K7	1
	12K8	2
	12KL8	2
	12L6	1
	12L8	2
	12Q7	3
	12R5	1
	12S8	4
	12SA7	2
	12SC7	2
	12SF5	1
	12SF7	2
	12SG7	1
	12SH7	1
	12SJ7	1
	12SK7	1
	12SL7	2
	12SN7	2
	12SQ7	3
	12SR7	3
	12SW7	3
	12SX7	2
	12SY7	2
	12U7	3
	12V6	1
	12W6	1
	12X4	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	12Z3	1
	13CM5 (XL36)	2
	13CW4	1
	Adapter Req'd Code: 1050-127	
	13DE7	3
	13DR7	3
	13EM7	3
	13FD7	2
	13FR7	3
	13GF7	2
	Adapter Req'd Code: 1050-144	
	14A4	1
	14A5	1
	14A7	1
	14AF7	2
	14B6	3
	14B8	2
	14C5	1
	14C7	1
	14E6	3
	14E7	3
	14F7	2
	14F8	2
	14GT8	3
	14H7	1
	14J7	2
	14JG8	3
	14N7	2
	14Q7	2
	14R7	3
	14S7	2
	14W7	1
	14X7	3
Total This Column		

■ Addition

DO NOT USE	TUBE TYPE	No. of CARDS
	14Y4	1
	15	1
	15A6 (PL83)	1
	15CW5 (PL84)	1
■	15DQ8 (PCL84)	2
	15EA7	3
	15EW6	1
■	15EW7	2
	15HB6	2
■	15KY8 Adapter Req'd Code: 1050-144	3
	16A5 (PL82)	1
	16A8 (PCL82)	2
	16AQ3 (XY88)	1
■	16GK6	1
	17AV5	2
	17AX4	1
	17AY3 Adapter Req'd Code: 1050-144	1
	17BH3 Adapter Req'd Code: 1050-144	1
	17BQ6	2
■	17BR3 (17R-K19)	1
	17BS3 Adapter Req'd Code: 1050-144	1
	17C5	1
	17CA5	1
	17CQ4	1
	17CU5	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	17D4	1
	17DE4	1
	17DM4	1
	17DQ4	1
	17DQ6	2
	17EW8 (HCC85)	2
	17GJ5 Adapter Req'd Code: 1050-144	2
	17GT5 Adapter Req'd Code: 1050-144	2
	17GW6	2
	17H3	1
	17HC8	3
	17JB6 Adapter Req'd Code: 1050-144	2
	17JK8	2
	17L6	1
■	17LD8 Adapter Req'd Code: 1050-144	3
	17R5	1
	17Z3 (PY81)	1
	18A5	2
	18DZ8	2
	18FW6	1
	18FX6	2
	18FY6	3
	18GD6	1
	18HB8	2
	19	2
	19AJ8	2
	19AU4	1
	19BG6	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	19C8	4
	19CL8A	2
	19D8 (UCH81)	2
	19EA8	2
	19EZ8	3
	19G3	1
■	19GQ7	3
	19HR6	1
	19HS6	1
	19HV8	2
	19J6	2
	19JN8	2
	19KG8	2
	19T8	4
	19V8	4
■	19X3 (PY80)	1
	19X8	2
■	19Y3 (PY82)	1
	20EQ7	2
	20EZ7	2
	21A6 (PL81)	2
	21EX6	2
	22BH3 Adapter Req'd Code: 1050-144	1
	22DE4	1
■	22JG6 Adapter Req'd Code: 1050-144	2
	24A	1
	25A6	1
	25A7	2
	25AV5	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	25AX4	1
	25BK5	1
	25BQ6	2
■	25BR3 (25R-K19)	1
	25C5	1
	25C6	1
	25CA5	1
	25CD6	2
	25CU6	2
	25DK4	1
	25DN6	2
	25DQ6	2
	25DT5	2
	25E5 (PL36)	2
	25EC6	2
	25EH5	1
	25F5	1
	25L6	1
	25W4	1
	25W6	1
	25Y5	2
	25Z5	2
	25Z6	2
	26	1
	26A6	1
	26A7	2
	26AQ8 (UCC85)	2
	26BK6	3
	26C6	3
	26D6	2
	26E6	1
	26Z5W	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	27	1
	28AK8 (UABC80)	4
	28D7	2
	30	1
■	30A5 (HL94)	2
	31	1
■	31A3 (UY41) Adapter Req'd Code: 1050-129	1
	32	1
	32ET5	1
	32L7	2
	34GD5	1
	35/51	1
	35A5	1
	35B5	1
	35C5	1
	35CD6	2
	35DZ8	2
	35EH5	1
	35GL6	1
	35HB8	2
	35L6	1
	35W4	1
	35Y4	1
	35Z3	1
	35Z4	1
	35Z5	1
	35Z6	2
	36	1
	36AM3	1
	37	1
	38	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	38A3 (UY85)	1
	39/44	1
	40FR5	1
	41	1
	42	1
	43	1
	45	1
	45Z3	2
	46	1
	47	1
	48	1
	50A5	1
	50B5	1
	50BK5	1
	50BM8 (UCL82)	2
	50C5	1
	50C6	1
	50DC4	1
	50EH5	1
	50FA5	1
	50FE5	1
	50FK5	1
	50FY8	2
	50HC6	1
	50HK6	1
	50L6	1
	50X6	2
	50Y6	2
	50Y7	2
	53	2
	55	3
	56	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	57	1
	58	1
	59	1
	60FX5	1
	70L7	2
	71A	1
	72	1
	75	3
	76	1
	77	1
	78	1
	79	2
	80	1
	81	1
	82	1
	83	1
	83V	1
	84/6Z4	1
	85	3
	89	1
	90C1	4
	101D	1
	101F	1
	102D	1
	CK108	1
	117L7	2
	117M7	2
	117N7	3
	117P7	3
	117Z3	1
	117Z4	1
	117Z6	2
	X155	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	231D	1
	244A	1
	247A	1
	TS251	2
	257A	1
	259A	1
	272A	1
	274A	1
	274B	1
	275A	1
	293A	1
	300B	1
	307A	1
	309A	1
	310A	1
	311A	1
	313C	2
	313CC	2
	328A	1
	329A	1
	337A	1
	338A	3
	339A	1
	349A	1
	350A	1
	350B	1
	351A	1
	352A	4
	367A	1
	384A	2
	395A	3
	396A	2
	403A	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	403B	2
	407A	2
	408A	2
	409A	2
	412A	2
	415A	2
	422A	1
	502A	3
	CK512AX	1
	CK526AX	1
	CK533AX	1
	559	1
	CK573AX	1
	629	3
	713A	2
	717A	2
	801A	2
	807	1
	809	1
	811A	1
	815	2
	816	1
	829B 2 Adapter Req'd Code: 1050-107	
	832A 2 Adapter Req'd Code: 1050-107	
	837	1
	842	2
	843	2
	865	1
	866A	1
	874	4
	884	3
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	885	3
	955 1 Adapter Req'd Code: 1050-9	
■	957 2 Adapter Req'd Code: 1050-9	
	959 2 Adapter Req'd Code: 1050-9	
	1005	3
	CK1006	2
	1007	3
	1229	1
	1273	1
	1280	1
	1603	1
	1609	1
	1612	2
	1613	1
	1614	1
	1619	1
	1620	1
	1621	1
	1622	1
	1624	2
	1625	1
	1626	1
	1629	2
	1631	1
	1633	2
	1635	4
	1641	2
	1644	2
	1851	1
	1852	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	2050	3
	2051	3
	5591	2
	5608A	2
	5618	1
	5636	2
	5639	1
	5641	3
	5642	1
	5643	3
	5644	4
	5647	2
	5651	4
	5654	2
	5656	2
	5659	1
	5661	1
	5663	3
	5670	2
	5672	1
	5675 1 Adapter Req'd Code: 1050-121	
	5676	1
	5677	1
	5678	1
	5686	3
	5687	4
	5690	2
	5691	2
	5692	2
	5693	1
	5696	3
	5702	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	5703	3
	5704	1
	5718	1
	5719	3
	5725	2
	5726	2
	5727	3
	5744	2
	5749	1
	5750	2
	5751	2
	5755	4
	5763	2
	5783	4
	5784	2
	5787	4
	5798	2
	5812	1
	5814A	2
	5825	1
	5829	2
	5838	1
	5839	1
	5840	3
	5842 (417A)	4
	5844	6
	5847 (404A)	3
	5852	1
	5854	1
	5875	1
	5876 1 Adapter Req'd Code: 1050-121	
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	5879	1
	5881	1
	5886	2
	5893 Adapter Req'd Code: 1050-121	1
	5894 Adapter Req'd Code: 1050-107	2
	5896	2
	5899	3
	5902	3
	5903	2
	5904	1
	5905	3
	5906	3
	5907	3
	5908	2
	5910	2
	5915	4
	5920 (E90CC)	6
	5930	1
	5931	1
	5932	1
	5933	1
	5963	6
	5964	6
	5965	6
	5971	2
	5977	2
	5987	3
	5992	2
	5993	1
	5998 (421A)	6
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6000	2
	6004	2
	6005	2
	6007 (DL67)	1
	6021	4
	6028	2
	6029	1
	X6030	2
	6050	1
	6064	1
	6065 (EF92)	1
	6072	4
	6073	1
	6074	1
	6080	6
	6082	6
	6084 (E80F)	1
	6085 (E80CC)	2
	6087	1
	6088	1
	6094	2
	6095	2
	6098	1
	6099	6
	6100	3
	6101	2
	6106	1
	6110	2
	6111	2
	6112	2
	6113	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6134	1
	6135	2
	6136	1
	6137	1
	6146	3
	6147	1
	6148	1
	6159	3
	6173 Adapter Req'd Code: 1050-121	1
	6184	2
	6186	3
	6188	4
	6189	6
	6197	3
	6201	2
	6202	1
	6203	1
	6205	3
	6206	3
	6211	6
	6216	2
	6221	2
	6222	2
	6223	3
	6225	3
	6227 (E80L)	1
	6245	2
	6247	2
	6252 Adapter Req'd Code: 1050-107	2
	6263 Adapter Req'd Code: 1050-121	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6264 Adapter Req'd Code: 1050-121	1
	6265	2
	6267 (EF86)	1
	6286	1
	6293	3
	6308	4
	6350	6
	6354 (150B2)	3
	6360	2
	6374 (EY84)	1
	6384	1
	6385	2
	6386	2
	6395	2
	6397	1
	6414	6
	6418	2
	6463	6
	6485	1
	6524 Adapter Req'd Code: 1050-107	2
	6533	3
	6542	4
	6550	1
	6626	1
	6627	1
	6660	1
	6661	1
	6662	1
	6663	2
	6669	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6677	2
	6678	4
	6679	4
	6680	4
	6681	2
	6686 (E81L)	2
	6687 (E91H)	3
	6688 (E180F)	2
	6689 (E83F)	1
	6754	2
	6761	2
	6788	3
	6814	3
	6829	6
	6832	6
	6850 2 Adapter Req'd Code: 1050-107	
	6877	3
	6883	3
	6887	2
	6888	3
	6907 2 Adapter Req'd Code: 1050-107	
■	6919	2
	6922 (E88CC)	6
	6939	2
	6943	2
	6947	2
	6948	2
	6973	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	6977 (DM160)	2
	7025	2
	7027	2
	7036	4
	7044	6
	7054	1
	7055	2
	7056	1
	7057	2
	7058	2
	7059	2
	7060	2
	7061	2
	7062 (E180CC)	6
	7119 (E182CC)	6
	7137	3
	7167	2
	7189	1
	7193	2
	7199	2
	7247	2
	7258	2
	7308 (E188CC)	4
	7316 (ECC186)	2
	7355	1
	7360	3
	7370	4
	7408	2
	7534 (E130L)	1
	7543	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	7551	2
	7558	2
	7581	1
	7586 1 Adapter Req'd Code: 1050-127	
	7587 1 Adapter Req'd Code: 1050-127	
	7591	2
	7643 (E80CF)	2
	7687	2
	7693 (E90F)	1
	7694 (E99F)	1
	7695	1
	7699	2
	7701	1
	7716	2
	7717	1
	7719	2
■	7721 (D3A)	1
	7722 (E280F)	1
	7724	3
	7728	2
	7729	2
	7730	2
	7731	2
	7732	1
	7733	1
	7734	4
	7737 (E186F)	2
	7754	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	7759	4
	7760	2
	7761	1
	7762	3
	7788 (E810F)	2
	7802	6
	7861	2
	7867	1
	7868 2 Adapter Req'd Code: 1050-144	
	7889	4
	7895 1 Adapter Req'd Code: 1050-127	
	7898	2
	7905	1
	8013A	1
	8016	1
	8032	3
	8056 1 Adapter Req'd Code: 1050-127	
	8058 2 Adapter Req'd Code: 1050-127	
■	8064	1
	8077	1
■	8084	1
	8102	2
	8106	1
■	8136	1
	8185	1
	8186	1
■	8203 1 Adapter Req'd Code: 1050-127	
■	8298	3
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
■	8393 Adapter Req'd Code: 1050-127	1
■	8431	2
	9001	2
	9002	2
■	9003	2
	9004 Adapter Req'd Code: 1050-9	1
	9005 Adapter Req'd Code: 1050-9	2
	9006	2
	9903 Adapter Req'd Code: 1050-107	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	38142	1
	C3M	1
	DC90	2
	E82CC	2
	E92CC	6
	EAA91	2
	EB41 Adapter Req'd Code: 1050-129	2
	EB91	2
■	EBC91	3
	ECC40 Adapter Req'd Code: 1050-129	2
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	ECC81	2
	ECC82	2
	ECC83	2
	ECF83	2
	ECF804	2
	ECH35	2
	EF40 Adapter Req'd Code: 1050-129	1
	EF42 Adapter Req'd Code: 1050-129	1
	EF804	1
	EL37	1
Total This Column		

DO NOT USE	TUBE TYPE	No. of CARDS
	EL42 Adapter Req'd Code: 1050-129	1
	EL821	1
	EL822	1
	EZ90	1
	GZ32	1
	GZ33	1
	KT61	1
	KT66	1
	KT88	1
	UF89	1
	W77	1
	Z729	1
Total This Column		

MODEL CA-4
ADAPTER

For Use With

MODELS 123A, 123R, 1230

NOTE: The Model CA-4 Adapter includes test sockets for Compactron, Novar, Nuvistor and 10-Pin based tubes.

Do Not Use	Tube Type	No. of Cards
	1AD2	1
	2AH2	1
	2AS2	1
	2CW4	1
	2DS4	1
	2DV4	1
	3AT2	1
■	4HA7	2
■	4HC7	2
	5BC3	1
■	5HC7	2
	6AF11	3
	6AG11	4
	6AL11	2
	6AR11	2
	6AS11	3
	6AV11	3
	6AX3	1
	6AY3	1
	6AY11	4
	6B10	4
	6BA3	1
	6BA11	3
TOTAL THIS COLUMN		

Do Not Use	Tube Type	No. of Cards
	6BD11	3
	6BE3	1
	6BF11	2
	6BH3	1
	6BJ3	1
	6BS3	1
	6C9	2
	6C10	3
	6CW4	1
	6D10	3
	6DS4	1
	6DV4	1
	6DW4	1
	6FJ7	2
	6FM7	2
	6FY7	2
	6G11	2
	6GA7	3
	6GE5	2
	6GF5	2
	6GF7	2
	6GJ5	2
	6GT5	2
TOTAL THIS COLUMN		

Do Not Use	Tube Type	No. of Cards
	6GV5	2
■	6GY5	2
	6HB5	2
	6HD5	2
	6HE5	2
	6HF5	2
■	6HJ5	2
	6J9	3
■	6J10	2
	6J11	2
	6JB6	2
■	6JE6	2
■	6JG6	2
■	6JT6	2
	6JZ8	2
	6K11	3
■	6KY8	3
	6M11	3
	6Q11	3
■	6T9	2
■	6T10	2
■	6U10	3
■	8B10	4
TOTAL THIS COLUMN		

Do Not Use	Tube Type	No. of Cards
■	10AL11	2
	10GF7	2
■	11AR11	2
■	12AL11	2
■	12AX3	1
	12AY3	1
■	12BE3	1
	12BS3	1
■	12BT3	1
	12GE5	2
	12GJ5	2
	12GT5	2
	12JB6	2
■	12JT6	2
	13CW4	1
	13FM7	2
	13GF7	2
■	13J10	2
■	15AF11	3
■	15BD11	3
■	15FM7	2
■	15FY7	2
	15KY8	3
TOTAL THIS COLUMN		

■ Addition

Do Not Use	Tube Type	No. of Cards
	16GY5	2
■	17AX3	1
	17AY3	1
■	17BE3	1
■	17BF11	2
	17BH3	1
	17BS3	1
	17C9	2
	17GE5	2
	17GJ5	2
	17GT5	2
TOTAL THIS COLUMN		

Do Not Use	Tube Type	No. of Cards
■	17GV5	2
	17JB6	2
■	17JT6	2
	17JZ8	2
■	17LD8	3
	19Q9	2
	21GY5	2
■	21HB5	2
	21HD5	2
■	21HJ5	2
	22BH3	1
TOTAL THIS COLUMN		

Do Not Use	Tube Type	No. of Cards
	22JG6	2
	24GA7	3
	28HD5	2
■	30AG11	4
■	30HJ5	2
	32GA7	3
■	33GT7	3
■	33GY7	3
	7586	1
	7587	1
	7868	2
TOTAL THIS COLUMN		

Do Not Use	Tube Type	No. of Cards
	7895	1
	7984	1
	8056	1
	8058	2
■	8149	1
■	8150	1
	8156	1
■	8203	1
■	8393	1
TOTAL THIS COLUMN		

PLACE
POSTAGE
HERE

THE HICKOK ELECTRICAL INSTRUMENT CO.

10514 Dupont Avenue

Cleveland, Ohio 44108

CARD ORDER
LEASE EXPEDITE

TUBE SUBSTITUTION GUIDE

1. 1X2A, 1X2B
2. 1B3GT, 1G3, 1J3, 1K3
3. 2AF4, 2AF4A, 2T4, (Note A)
4. 3BY6, 3CS6
5. 3CB6, 3CF6, 3DK6, 3BZ6
6. 4BC5, 4CE5
7. 4CB6, 4DK6, 4BZ6
8. 4BQ7, 4BZ7, 4BC8, 4BZ8 (Note B)
9. 4BS8, 4BX8
10. 5DH8, 5BE8
11. 5U4G, 5U4GA, 5U4GB, 5AS4A
12. 5Y3GT, 5Y3GA, 5V4GA, 5AZ4
13. 6AX4GT, 6DA4
14. 6BQ6GT, 6BQ6GTA, 6BQ6GTB, 6BQ6GA, 6CU6, 6DQ6, 6DQ6A
15. 6AU5GT, 6AV5GT, 6AV5GA
16. 6AG5, 6BC5
17. 6AF4, 6T4 (Note A)
18. 6AT6, 6AV6
19. 6BD6, 6BA6
20. 6BK7A, 6BQ7A, 6BZ7, 6BZ8/X155, 6BC8 (Note B)
21. 6BH8, 6AU8, 6AU8A
22. 6BL7GT, 6BX7GT
23. 6BY6, 6CS6
24. 6CB5A, 6CL5
25. 6CB6, 6CB6A, 6CF6, 6DE6, 6DK6, 6BZ6
26. 8AU8, 8AU8A, 8BH8, 8BH8A
27. 12AC6, 12AF6 △
28. 12AD6, 12AG6, 12EG6 △
29. 12AT6, 12AV6
30. 12AV7, 12AZ7, 12AT7
31. 12AX4GT, 12D4
32. 12AX7, 12AX7/ECC83, 12DF7
33. 12BD6, 12BA6
34. 12BQ6GT, 12BQ6GTA, 12BQ6GTB, 12CU6, 12DQ6, 12DQ6A
35. 12BY7, 12BV7
36. 12CA5, 12R5, 12C5
37. 17AX4GTA, 17D4
38. 17CA5, 17R5, 17C5
39. 25BQ6GTA, 25BQ6GTB, 25CU6
40. 25CA5, 25C5

The following tubes are listed from left to right in ascending order. No tube can be used to replace one listed to the right of it.

41. 5BS8, 5BQ7
42. 6CA5, 6CU5
43. 6CD6G, 6DN6, 6CD6GA
44. 6K6GT, 6V6GT, 6EF6, 6W6GT
45. 6U4GT, 6W4GT, 6AX4GT, 6AU4GT, 6AU4GTA, 6DA4
46. 6X5, 6X5GT, 6AX5GT
47. 12L6GT, 12W6GT, 12EN6
48. 17CA5, 17CU5
49. 25EC6, 25DN6, 25CD6GB
50. 25L6GT, 25W6GT
51. 25W4GT, 25AX4GT

Substitution may not work because of different cutoff characteristics.

52. 3AU6 (Sharp), 3BA6 (Remote)
53. 4AU6 (Sharp), 4BA6 (Remote)
54. 6AU6 (Sharp), 6BA6 (Remote)
55. 6BH6 (Sharp), 6BJ6 (Remote)

△ Used in 12V hybrid auto radios.

(Note A) These tubes are used in UHF applications and may not work when substituted.

(Note B) These tubes are used as cascode RF amplifiers in VHF tuners and may be interchanged for testing purposes if carefully selected.

to produce the flared cone. For general usage such as radio and TV, most speakers are made of glued, hard paper for reasons of economy. Fidelity is a secondary, although still important, consideration in these applications.

In comparing the simple conical design with flared and corrugated-conical configurations, the flared design produces a sharper directional pattern on high frequencies because of its exponential curvature and added rigidity. The corrugated conical, having considerable radial rigidity, has a wider directional response pattern.

Other facets of cone design that materially affect the operation of a speaker are its size and weight. To reproduce the "popular" or mid-range audio frequencies without regard for the extremely low or high frequencies, a 5″ to 10″ unit having a hard paper cone is most often used. This type of speaker is very efficient in the mid-audio range; however, at the low end of the audio spectrum, its radiation resistance is too small and the cone tends to break-up or wrinkle, producing very poor low-frequency output. At the high end of the spectrum, cones of the larger 8″ to 10″ units, even though vents "break-up" when subjected to long, low-frequency movements necessary to produce loud, low tones. High-frequency speakers or tweeters are small and have very light, rigid cones which are capable of rapid vibration.

From what has been said, it follows that woofer cones must travel a considerable distance, while tweeter cones are very limited in their travel. For a 10″ speaker to produce an output of .02 acoustic watts at 1,000 cps, the cone must travel .0005″, while to produce the same .02 acoustic watts at 100 cps, it must move .050″. Thus, you will find that woofer cones travel a half inch or more, while the movement of a tweeter is very minute and cannot be seen with the naked eye.

Voice Coil

Voice coils of modern speakers generally follow one of four styles. See Fig. 3. Paper voice-coil forms are used to facilitate mass production. Voice coils and cones are assembled separately and then combined in a machine operation. Use of a paper form, while it simplifies construction, creates an additional problem in that it adds bulk and weight, neither of which helps be made using square wire and thermo-seting cement. Again, the paper form is eliminated and more voice-coil mass is provided for a given area (Fig. 4). As you can see, both the square and the circle have the same outer dimensions, but the square has the larger area. This means that smaller diameter square wire can be used, further reducing the size of the necessary magnet gap. Edge-wound ribbon voice coils are even more efficient, for the reasons just cited. Made of aluminum and copper, they are used in a great many of the large high-quality speakers designed to reproduce low- and mid-range tones.

We previously mentioned that, in woofers, the cone was required to move a considerable distance, while in tweeters it moved hardly at all. This creates certain problems in speaker design. To obtain the maximum magnetic field with a given magnet size, the gap must be as small as possible. If the voice coil is the same length as the magnet gap (Fig. 5A), then the voice coil will cut magnetic lines of various forces as it moves, and result in distortion. Therefore, the practice is to make the voice coils o

• *Please turn to page 6*

MODEL 121 TUBE TEST DATA CARDS Code No. 3122-86

Group 106 - New Tube Types (50 Cards for 33 Tubes)

Tube Type	No. of Cards	Tube Type	No. of Cards
3AF4A	1	6CH7	1
3BU8	2	6SR7	2
3CE5	1	8CM7	2
3Q4	1	8SN7	3
4BN6	2	9AU7	3
4BU8	2	12AC6	1
4BZ8	1	12BK5	1
4CE5	1	12BN6	2
4CS6	1	12CS6	1
5AV8	2	12SR7	2
5B8	2	17AX4	1
5BQ7A	1	17AV5	2
5BZ7	1	17C5	1
6AS7	1	17CA5	1
6AU7	3	19BG6	2
6AX7	1	35B5	1
6CA5	1		

MODEL 121 TUBE TEST DATA CARDS Code No. 3122-92 – $9.50

Group 107 - New Tube Types (100 Cards for 72 Tubes)

Tube Type	No. of Cards	Tube Type	No. of Cards
1A5	1	6SG7	1
1A7	2	6SH7	1
1AG4	1	6V8	3
1N5	1	7AF7	1
1S4	1	7AG7	1
1V2	1	7B6	2
1V6	2	7B8	2
2T4	1	7E6	2
3A2	1	7F8	1
3BA6	1	7H7	1
3BE6	2	7Q7	2
3Q5	1	7W7	1
3S4	1	12A8	2
5AS4	2	12AG6	1
5AU4	2	12BA7	2
5AW4	2	12CM6	1
5BE8	2	12H6	1
5V6	1	12J5	1
5X4	2	12SC7	1
5Y4	2	12SF7	2
6AL7	2	12SG7	1
6AN4	1	12SH7	1
6AQ6	2	12SJ7	1
6BA7	2	12SL7	1
6BC7	2	19J6	1
6BL4	1	25BK5	1
6DC6	1	25C5	1
6F5	1	25W6	1
6F6	1	25Z6	1
6F8	1	35A5	1
6G6	1	50BK5	1
6K7	1	117L7	2
6Q7	2	117M7	2
6S8	3	117Z3	1
6SF5	1	X155	1
6SF7	2	5879	1

MODEL 121 TUBE TEST DATA CARDS — Code No. 3122-95 ~ 9.50
Group 108 - New Tube Types (100 Cards for 67 Tubes)

Tube Type	No. of Cards	Tube Type	No. of Cards
1J3	1	6CZ5	2
2B3	1	6DA4	1
2CY5	1	6DB5	1
3B2	1	6DK6	1
3BN4	1	6DN6	2
3C2	1	8AU8	2
3CY5	1	8BA8A	2
3DK6	1	8BH8	2
4BA6	1	8BN8	2
4BC5	1	8CN7	2
4BE6	2	8CS7	2
4BX8	1	9CL8	2
4CY5	1	9U8	2
4DK6	1	9X8	2
5BS8	1	10C8	2
5BT8	2	12AY7	1
5CM6	1	12BW4	1
5CM8	2	12CN5	1
5V3	2	12CT8	2
6AN5	1	12D4	1
6AR5	1	12DB5	1
6AZ8	2	12R5	2
6BJ7	2	17CU5	1
6BJ8	2	17D4	1
6BK4	1	17H3	1
6BN8	2	17L6	1
6BT8	2	17R5	2
6BV8	2	18A5	2
6BW4	1	19X8	2
6BX8	1	25AV5	2
6CL8	2	25CA5	1
6CM8	2	25DQ6	2
6CR6	2	35CD6	2
6CY5	1		

MODEL 121 TUBE TEST DATA CARDS Code No. 3122-95
Group 108 - New Tube Types (100 Cards for 67 Tubes)

Tube Type	No. of Cards	Tube Type	No. of Cards
1J3	1	6CZ5	2
2B3	1	6DA4	1
2CY5	1	6DB5	1
3B2	1	6DK6	1
3BN4	1	6DN6	2
3C2	1	8AU8	2
3CY5	1	8BA8A	2
3DK6	1	8BH8	2
4BA6	1	8BN8	2
4BC5	1	8CN7	2
4BE6	2	8CS7	2
4BX8	1	9CL8	2
4CY5	1	9U8	2
4DK6	1	9X8	2
5BS8	1	10C8	2
5BT8	2	12AY7	1
5CM6	1	12BW4	1
5CM8	2	12CN5	1
5V3	2	12CT8	2
6AN5	1	12D4	1
6AR5	1	12DB5	1
6AZ8	2	12R5	2
6BJ7	2	17CU5	1
6BJ8	2	17D4	1
6BK4	1	17H3	1
6BN8	2	17L6	1
6BT8	2	17R5	2
6BV8	2	18A5	2
6BW4	1	19X8	2
6BX8	1	25AV5	2
6CL8	2	25CA5	1
6CM8	2	25DQ6	2
6CR6	2	35CD6	2
6CY5	1		

TEST CIRCUIT SYMBOLS

C	Cut-off test circuit for plate current under high grid bias.
D	Diode circuit test.
H	Hybrid auto radio tube test circuit.
K	Knee plate current test; normal screen voltage, low plate voltage and zero grid bias.
P	Pentode circuit test, Class A operation.
T	Triode circuit test, Class A operation.
Z	Zero grid bias, plate current test in triode circuit.